[illegible]
[illegible]

BLISTER RUST WORK

IN THE FAR WEST

January 1 to December 31, 1932

Spokane Branch
Division of Blister Rust Control
618 Realty Bldg.
Spokane, Washington

Second growth white pine in north Idaho. A nearly pure stand of second growth white pine 40-60 years old, near Clarkia, Idaho. The stream type contains heavy concentrations of *Ribes petiolare*, *R. inerme* and *R. lacustre*. Pine infection is heavy along lower slopes. In the extreme right can be seen part of the stream type area cleared with the bulldozer. Photograph by 116th Photo Section, Washington National Guard, Lt. Eric Danielson, Pilot, H. M. Cowling, Photographer.

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January 1 to December 31, 1932

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INTRODUCTION

The most important occurrences in the western blister rust control program during the calendar year 1932 may be briefly summarized as follows:

(1) Decrease in the scope of cooperative control program with the state and private owners in north Idaho.

(2) A material increase in scope of control operations on national forests.

(3) Strong evidence that the rust is becoming more widely disseminated and more firmly established in north Idaho.

(4) Material decrease in the experimental local control program in California, in order to continue the Idaho control program with less funds available.

(5) The development of the sugar pine survey in cooperation with the Forest Service in California.

In the face of the economic depression and consequent demoralization of the lumber market, several private concerns in north Idaho with whom this Division had been cooperating in blister rust control work were forced to either discontinue or materially decrease their cooperation. Thus, the Clearwater Timber Protective Association decreased its allotment for this purpose from $20,000.00 to $10,000.00; the Potlatch Timber Protective Association discontinued cooperative work entirely; and the group of local owners in the vicinity of Clarkia, Idaho decreased their allotment from $6,000.00 to $1,200.00. On the other hand the allotment by the State of Idaho for cooperative control work in the Priest Lake vicinity was increased from $5,000.00 to $8,000.00.

Allotments by the Forest Service for blister rust control work were increased from $195,000.00 during the fiscal year 1932 to $275,200.00 for the fiscal year 1933. The result of this increase was that two major operations were carried on during the field season of 1932, one on the Clearwater and one on the St. Joe National Forest. In accordance with the cooperative program the Division of Blister Rust Control furnished all technical supervision, including camp bosses and checkers for these operations.

On all control operations in north Idaho, the scheme of work for 1932 was shifted from stream type Ribes eradication to complete initial eradication. This alteration was considered necessary in view of (a) the rapid intensification of the rust and (b) uncertainty as to cooperative funds in future years.

At the end of 1931, 61 centers of pine infection were known to exist in the Inland Empire. During 1932, 16 additional pine infection centers were found, bringing the total number to 77. In addition, Ribes infections were so general over the Inland Empire white pine belt that no detailed records could be kept of them. Specifically, new Ribes infections were found on the Kaniksu National Forest, the Palouse Division of the St. Joe National Forest, and on the Selway National Forest.

Reduction of total allotments to the western blister rust control program, and the necessity for maintaining the going control operations in Idaho necessitated a considerable decrease in the scope of experimental Ribes eradication operations in California. The work during 1932 consisted primarily of reeradication on the northern part of the Stanislaus National Forest, in addition to which a small acreage of initial eradication was completed. The proximity of the rust to northern California makes it imperative that the California experimental program be again built up as rapidly as possible.

A project most important to the development of the California blister rust control program was undertaken in 1932 in the form of a sugar pine survey or inventory made jointly by this Division and the Forest Service. This survey is designed to accurately locate all areas of sugar pine within the state, to determine their present and reproductive value, their ownership, and so far as possible their order of priority in the control program. Experimental Ribes eradication and control reconnaissance data will be applied to these sugar pine data as rapidly as possible, and from this basic information a control program for the region will be developed.

During the calendar year 1932 the Western Branch of the Division of Blister Rust Control operated upon the basis of funds available from two fiscal years as follows:

For the period January 1, 1932 to June 30, 1932, the applicable appropriations were "32133.14, Salary and Expenses Bureau of Plant Industry, Blister Rust Control, 1932" in the amount of $239,016 (for the entire fiscal year), and "31/2133.14, Salary and Expenses, Blister Rust Control, 1931-1932", in the amount of $50,000 (for the period April 1, 1931 to June 30, 1932. Of this appropriation $5,167.66 was expended during June 1931). In addition $4,500 from the available appropriation "32133.25, Salaries and Expenses, Bureau of Plant Industry, Barberry Eradication, 1932" was allotted to this Division for the entire fiscal year 1932, for

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During the calendar year 1932 the Western Branch of the Division of Blister Rust Control operated upon the basis of funds available from two fiscal years as follows:

For the period January 1, 1932 to June 30, 1932, the applicable appropriations were "[illegible], Salary and Expenses, Bureau of Plant Industry, Blister Rust Control, 1932" in the amount of [illegible] (for the entire fiscal year), and "[illegible], Salary and Expenses, Blister Rust Control, 1931-1932", in the amount of [illegible] (for the period April 1, 1931 to June 30, 1932. Of this appropriation [illegible] was expended during June 1931). In addition [illegible] from the available appropriation "32136.36, Salaries and Expenses, Bureau of Plant Industry, Barberry Eradication, 1932" was allotted to this Division for the entire fiscal year 1932, [illegible]

experimental work in the eradication of barberry by chemicals. The total amount of $288,347.32, together with $6,375.00 additional, which was made available from funds originally allotted to eastern blister rust work, was allotted as follows:

Project	For the Period 7/1/31-6/30/32
A. Delaying spread of blister rust.	
1. Field surveys in Northwestern States to determine location of dangerous centers of infection and to follow the natural advance and establishment of blister rust in the northern area	$14,000.00
2. Field surveys in Oregon	1,250.00
3. Field surveys in California	3,350.00
B. Development of application of local control.	
1. Federal lands in Washington, Idaho and northwestern Montana	37,350.00
2. Federal lands in Oregon	6,360.00
3. Local control on state and private lands in Idaho two dollars for one dollar cooperation between Federal Government and timber owners	71,596.96
4. Studies of local control and its costs in California	15,000.00
5. Control reconnaissance and Ribes survey, Oregon	6,250.00
6. Control reconnaissance and Ribes survey, California sugar pine areas	5,000.00
C. Investigative work, Division of Forest Pathology	29,166.00
D. Experimental work on chemical eradication of Ribes and barberry and studies in Ribes ecology	36,096.00
E. Educational work	6,000.00
F. Summarization of field data	2,000.00
G. Field supervision, maintenance of Spokane office, miscellaneous supplies	33,700.00
H. Miscellaneous allotments.	
1. General control ... $19,710.00	
2. Mycology ... 500.00	
3. Department reserve ... 2,200.00	
4. Bureau reserve ... 1,003.37	
5. Special reserve - deficiency appropriation ... 14,200.00	37,613.37
Total	$294,722.32

From July 1, 1932 to December 31, 1932 the applicable appropriation was "33133.14, Salaries and Expenses, Bureau of Plant Industry, Blister Rust Control, 1933", in the amount of $204,000 (for the entire

fiscal year). In addition, $1,800 from the available appropriation "321??.35, Salaries and Expenses, Bureau of Plant Industry, Blister Rust Control, 1933", was allotted to this Division for the entire fiscal year for experimental work in the eradication of barberry by chemicals. The total amount of $209,800.00 was allotted as follows:

Project	For the Period 7/1/32-6/30/33
A. Delaying spread of blister rust.	
1. Field surveys in Northwestern States to determine location of dangerous centers of infection and to follow the natural advance and establishment of blister rust in the northern area	$13,283.52
2. Field surveys in Oregon	2,587.58
3. Field surveys in California	[illegible]
B. Development of application of local control.	
1. Federal lands in Washington, Idaho and northwestern Montana	43,5[illegible]
2. Local control on state and private lands in Idaho, two dollars for one dollar cooperation between Federal Government and timber owners	35,319.78
3. Studies of local control and its costs, California	5,302.4[illegible]
4. Control reconnaissance and Ribes survey, sugar pine areas of California	9,283.37
C. Investigative work, Division of Forest Pathology	[illegible],100.00
D. Experimental work on chemical eradication of Ribes and barberry and ecological studies	21,437.34
E. Educational work	2,818.14
F. Summarization of field data	1,750.00
G. Field supervision, maintenance of Spokane office, miscellaneous supplies	22,2[illegible].07
H. Miscellaneous allotments.	
1. General control ... 22,492.00	
2. Mycology ... 572.00	
3. Bureau reserve ... [illegible],030.00	
4. Department reserve ... 156.00	
5. Reserve for impounded balances ... 10,931.13	36,2[illegible].13
Total	$209,800.00

No major changes were made in the organization of the work or the grouping of the personnel during 1932. As in the past, the majority of the employees were permanently headquartered at Spokane. The following is the permanent western personnel who were employed during the period

fiscal year). In addition [illegible] from the available appropriation [illegible], Salaries and Expenses, Bureau of Plant Industry, [illegible] Control, 1937, was [illegible] for the [illegible] experimental work in the eradication of barberry or [illegible]. The total amount of [illegible] was [illegible] as follows:

Project	For fiscal year [illegible]
A. Delaying [illegible] of [illegible]	
1. Field surveys in [illegible] to [illegible] location of [illegible] and to follow the natural [illegible] of [illegible] in the [illegible]	[illegible]
2. Field surveys in [illegible]	[illegible]
3. Field surveys in California	[illegible]
B. Development of [illegible] of local control.	
1. Federal [illegible] in [illegible] and [illegible] Montana	[illegible]
2. Local control on [illegible] two dollars per one dollar [illegible] Federal [illegible]	[illegible]
3. Studies of local [illegible]	[illegible]
4. Control [illegible] areas of California	[illegible]
C. Investigative work, [illegible]	[illegible]
D. Experimental work [illegible] barberry [illegible]	[illegible]
E. [illegible] work	[illegible]
F. Summarization of field data	[illegible]
G. Field supervision, [illegible] miscellaneous supplies	[illegible]
H. Miscellaneous [illegible]	
1. General [illegible]	[illegible]
2. [illegible]	[illegible]
3. [illegible]	[illegible]
4. [illegible]	[illegible]
5. Reserve [illegible]	[illegible]
Total	[illegible]

No major changes were made in the organization of the [illegible] of the [illegible] during [illegible]. As in the past, the majority of the employees were [illegible] in [illegible]. The [illegible] [illegible] work [illegible]

covered by this report:

1. Supervisory:

   a. In charge of Western Branch Office, S. N. Wyckoff, Senior Pathologist.

2. Project Leaders:

   a. Ribes Ecological Studies. C. W. Waters, Agent, full time summer months, w.a.e. during the winter period.

   b. Development of methods of Ribes eradication. *C. C. Strong, Associate Forester, assisted by H. E. Swanson, Agent, C. R. Johnson, Associate Pathologist, and J. F. Breakey, Agent.

   c. Cooperative Local Control, Idaho. *C. C. Strong, Associate Forester, assisted by B. A. Anderson, W. G. Guernsey and R. J. Hartman, Junior Foresters; H. E. Swanson, F. O. Walters, L. L. White, K. D. Nelson and H. F. Geil, Agents.

   d. Cooperative Local Control and Control Reconnaissance, National Parks, Washington. *C. C. Strong, Associate Forester, assisted by H. G. Riley, Junior Forester.

   e. Cooperative Local Control, Oregon. L. N. Goodding, Associate Pathologist.

   f. Educational Work, Kermit Miller, Agent (resigned Oct. 16, 1932), assisted by Miller Cowling, Agent.

   g. Studies on Spread of the Rust and Damage to Pine. A. L. Joy, Junior Forester, assisted by R. E. Myers, F. F. Staat and C. H. Chapman, Agents.

   h. Experimental Chemical Eradication of Ribes and Barberry. H. R. Offord, Agent, assisted by C. R. Quick, Junior Microanalyst, E. P. d'Urbal, Assistant Chemist, W. R. Van Atta, W. E. Draper, R. W. Vance (resigned July 15, 1932), L. E. Keyser and J. A. Vogtmann, Agents, and Miss Frances Greenfield, Junior Clerk-Stenographer.

   i. Summarization of Field Data. H. P. Barss, Agent, during summer and Collaborator during winter period, assisted by T. F. Sipe, Agent during summer and Collaborator during winter period.

*For the purpose of coordination and standardization of the various eradication projects (b, c, and d) in the Inland Empire white pine belt, these were all placed under the supervision of C. C. Strong, Associate Forester.

3. State Leaders:

a. Montana. C. R. Johnson, Associate Pathologist.

b. Oregon. L. N. Goodding, Associate Pathologist, assisted by Miss D. L. Anderson, Agent (resigned August 31, 1935).

c. California. C. A. Root, Associate Pathologist, assisted by project leader W. V. Benedict, Assistant Forester, with his assistants, T. H. Harris, E. Blomstrom and D. R. Miller, Junior Foresters (reconnaissance); F. A. Patty, Assistant Pathologist (Ribes Ecology); stenographic work performed by Miss E. J. Freitkis, Agent.

4. Clerical Work:

R. L. MacLeod, Agent, assisted by A. H. Glasgow, Agent; Miss M. L. Nichols, Senior Clerk and Temporary Special Disbursing Agent, assisted by Mrs. E. M. Jump and Mrs. M. C. Dowdy, Clerks. Mrs. L. E. Klatt, Clerk, assisted by Mrs. A. M. Anderson, Junior Typist, Miss M. V. Lynch, Under Clerk-Typist, Miss C. Ryan, Junior Clerk-Stenographer, and Miss M. Storaasli, Junior Stenographer.

5. Collaborators:

H. P. Barss, Corvallis, Oregon.
Dr. J. P. Bennett, Berkeley, California.
Dr. Carl C. Epling, Los Angeles, California.
A. O. Garrett, Salt Lake City, Utah.
Dr. T. H. Goodspeed, Berkeley, California.
Dr. D. R. Hoagland, Berkeley, California.
Dr. C. E. Hubert, Moscow, Idaho.
B. O. Longyear, Ft. Collins, Colorado.
Rutledge Parker, Missoula, Montana.
F. P. Sipe, Corvallis, Oregon.

BLISTER RUST CONTROL WORK IN MONTANA

1932

Blister rust control activities in Montana were continued as a cooperative project between the Bureau of Plant Industry and the Montana Department of Agriculture, the Montana Forestry Department, the School of Forestry, University of Montana, the Northern Montana Forestry Association, and the Blackfoot Protective Association. There is given below the amendment to the basic memorandum of understanding which was drawn up to cover the cooperative work for the fiscal year 1933 beginning July 1, 1932:

AMENDMENT TO

MEMORANDUM OF UNDERSTANDING

Effective July 1, 1927

Between

THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY, THE MONTANA STATE DEPARTMENT OF AGRICULTURE, MONTANA STATE FORESTRY DEPARTMENT, THE SCHOOL OF FORESTRY, UNIVERSITY OF MONTANA, AND THE NORTHERN MONTANA FORESTRY ASSOCIATION

for Cooperative Work in Controlling White Pine Blister Rust in Montana.

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry, the Montana State Department of Agriculture, Montana State Forestry Department, the School of Forestry, University of Montana and the Northern Montana Forestry Association effective July 1, 1927, to continue in effect until June 30, 1928, shall be continued in full force and effect in all its provisions for the fiscal year ending June 30, 1933 with the exception of paragraph F-6 which shall be amended to read as follows:

F-6. That for the fiscal year July 1, 1932 to June 30, 1933 the Montana State Department of Agriculture will expend about $4,000.00; the Montana State Forestry Department about $1,700.00; the School of Forestry, University of Montana about $300.00; the Northern Montana Forestry Association about $1,000.00; the Blackfoot Protective Association, having been added to this agreement in the amendment for the fiscal year ending June 30, 1932, will expend about $1,000.00; and the Federal Government in behalf of the United States Department of Agriculture, Bureau of Plant Industry about $2,300.00 in connection with the work herein provided for.

The undersigned also mutually agree that this memorandum of understanding shall take effect July 1, 1932 and continue in effect until

[illegible]

[illegible]

Blister rust control activities in [illegible] cooperative project between the [illegible] Department of Agriculture, the Montana [illegible] Forestry, University of Montana, the Northern Montana [illegible] and the Blackfoot Protective Association. [illegible] amendment to the basic memorandum of [illegible] cover the cooperative work for the fiscal year [illegible] 1936.

[illegible]

[illegible]

[illegible]

between

THE UNITED STATES DEPARTMENT OF [illegible]

THE MONTANA STATE DEPARTMENT OF [illegible]

THE SCHOOL OF FORESTRY, UNIVERSITY OF [illegible]

NORTHERN MONTANA [illegible]

Cooperative Work in Controlling [illegible] Blister Rust in Montana.

[illegible]

The undersigned mutually agree that [illegible] between the United States Department of [illegible] the Montana State Department of Agriculture [illegible] Department, the School of Forestry, University [illegible] Montana Forestry Association effective July 1, 19[illegible] until June 30, 1936, shall be continued in full [illegible] effect in all its provisions for the fiscal year ending June 30, [illegible] of paragraph F-6 which shall be amended to read as follows:

F-6. That for the fiscal year [illegible] the Montana State Department of Agriculture will [illegible] the Montana State Forestry Department about $1,[illegible] Forestry, University of Montana about $[illegible]; the [illegible] Forestry Association about $1,[illegible]; the Blackfoot [illegible] having been added to this agreement in the amendment [illegible] ending June 30, 1936, will expend about $[illegible] Government in behalf of the United States Department of [illegible] Bureau of Plant Industry about $[illegible] in connection with the work herein provided for.

The undersigned [illegible] mutually [illegible] that this memorandum of understanding shall take effect July 1, 19[illegible] and continue in effect until

June 30, 1933, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

____________________	A. H. Stafford Commissioner, Montana Department of Agriculture.
March 6, 1933	Rutledge Parker State Forester, Montana Forestry Department.
March 24, 1933	I. W. Cook Act. Dean, School of Forestry, University of Montana.
March 22, 1933	A. W. Boorman Secretary, Northern Montana Forestry Association.
Feb. 7, 1933	Roscoe Haines Secretary, Blackfoot Protective Association.
April 4, 1933	Wm. A. Taylor Chief, Bureau of Plant Industry, U. S. D. A.

U.S. DEPARTMENT OF AGRICULTURE
BLISTER RUST CONTROL

SAVENAC NURSERY

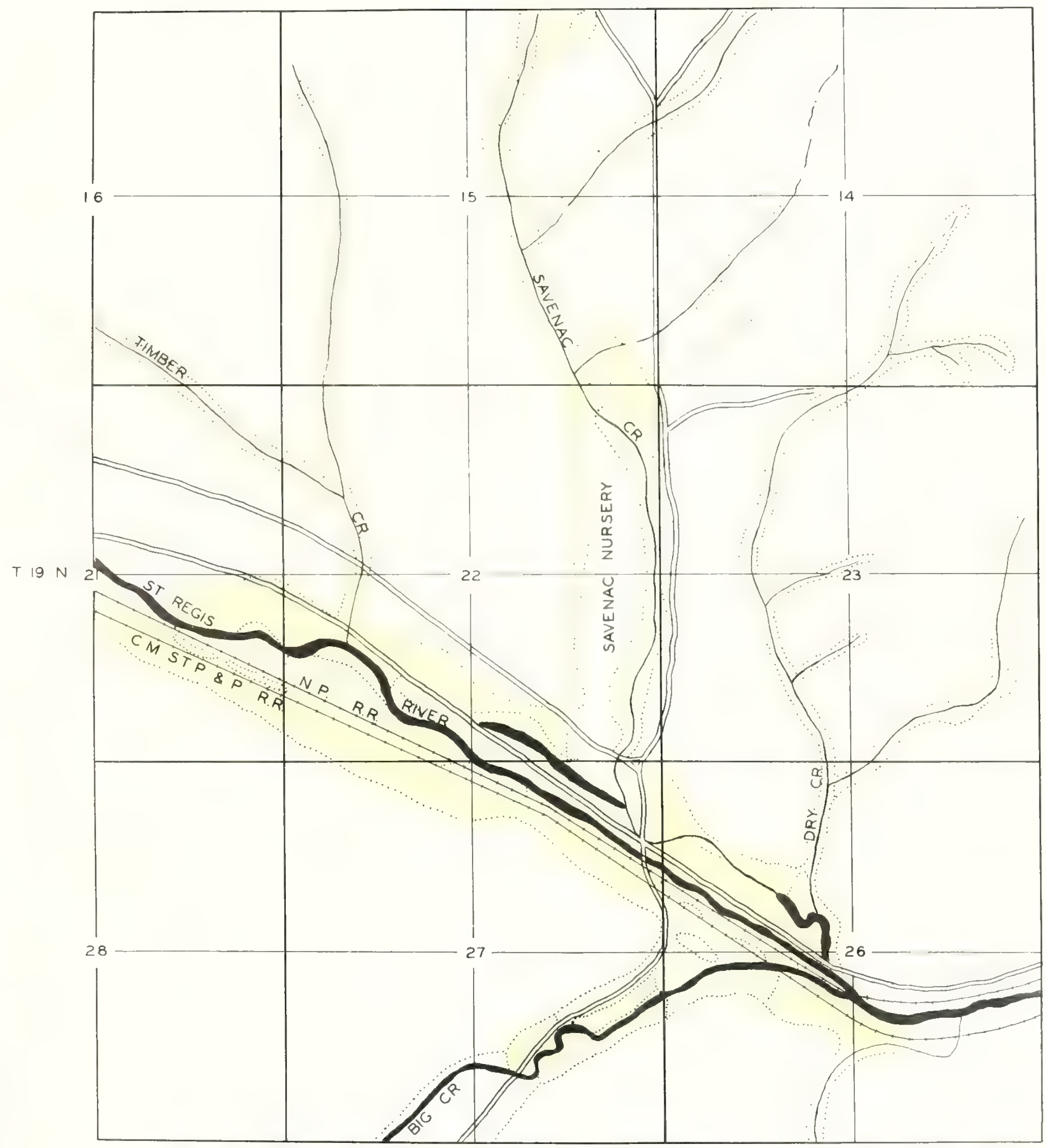
MONTANA MERIDIAN

10 20 30 40 CHAINS

SCALE

LEGEND

NEW GRASS AREA — NATURAL GRASS AND OPEN BRUSH — BRUSH



ANNUAL REPORT 1932
C.H. JOHNSON

BLISTER RUST CONTROL ACTIVITIES, SAVENAC NURSERY MONTANA

By
C. H. Johnson
Associate Pathologist

INTRODUCTION

Ribes eradication by means of brush elimination followed by establishment of grass sod to reduce regeneration of Ribes which has been conducted at the Savenac Nursery from 1929 to 1931 was continued in 1932. One man was engaged in brush disposal during the entire season and extra help was employed for short periods to assist in the Ribes reeradication and clearing and burning operations. In addition, another experiment described in the body of this report was conducted.

The Forest Service supplied funds for temporary labor for brush disposal and Ribes reeradication and the Division of Blister Rust Control supervised all activities.

RIBES ERADICATION BY HAND PULLING AND BRUSH REMOVAL METHODS

This work was divided into two classes. Ribes reeradication was conducted, from May 25 to June 11, by a crew of two men on the entire area with the exception of a small acreage where experiments in clearing, burning and draining by blasting beaver dams were planned. In October the stream type was again worked by one man.

The work of eliminating the Ribes through the removal of all brush cover was concentrated on normally wet sites which occur primarily along upper Savenac, Dry and Big Creeks. After these areas were drained the brush was cut and either piled or scattered. All brush cut during the period of early May to about the middle of August was burned in September. A sufficient number of men with fire tools, power pump and hose and knapsack tanks with pumps were on the job during the burning operation.

Results

The following table gives the results of the work:

TABLE NO. 1

RIBES ERADICATION, SAVENAC NURSERY, MONTANA

Drainage	Acres	Total Ribes Removed			Acreage	
		Seedlings	Sprouts	Mature bushes	Cleared	Burned
St. Regis River	339.0	1,470	753	37	2	1
Savenac Creek	101.0	535	75	23	12	9
Big Creek	66.0	386	463	75	3	1
Dry Creek	*73.5					
Timber Creek	38.3	4	60	10	0	0
Hollins Creek	30.0	5	110	12	0	0
Total	618.8	2,400	1,461	160	29	15

*13,570 feet of live stem removed.

Only Ribes pulled during the early spring are shown in the above table. No figures are available for Ribes removed in conjunction with brush clearing.

TABLE NO. 2

STATEMENT OF COSTS OF BLISTER RUST WORK AT SAVENAC NURSERY, 1933

Item	Expenditures by Activities			
	Eradn. by Hand Pull. and Brush Disposal	Seeding	Special Experiments Drainage and Incinerator	Total
Salaries, Permanent Employees	$ 425.00	$125.00	$267.50	$817.50
Wages, Temporary Employees	675.70		77.24	752.94
Transportation, Travel and Expenses	75.00	21.30	18.03	114.33
Subsistence	143.32	25.00	39.75	208.07
Equipment	17.02		7.50	24.52
Seed		41.40		41.40
Total	$1,336.04	$212.70	$410.02	$1,958.76

*309.54 paid from Forest Service allotment.

Conclusion

The last of the dangerous brush patches has been removed. Scattered brush piles remain, but a thorough search was conducted in these places and the Ribes were removed. A heavy germination of seedlings is expected on a small area along Dry Creek where R. petiolare was hand pulled and the brush was removed. The potential supply of Ribes along the major drainages has largely been destroyed as a result of periodic burning, sowing of grass seed and the continuous removal of seedlings. It is now possible for the first time to report that Ribes eradication has been conducted to the outside limits of the protection zone around Savenac Nursery.

A high degree of sanitation has been achieved through brush removal which has been followed by seeding. This condition can be easily maintained. During the past season local ranchers cut grass for winter feed from land which was formerly occupied by brush along Big Creek, upper Savenac and the upper St. Regis. Additional acreage for pasture was fenced along the St. Regis River.

The checking reports for upper Savenac and Dry Creeks are not encouraging due to the fact that the checks were made in July while brush removal was not completed until October 15. The next check should more nearly represent the true condition at present.

EXPERIMENTAL WORK

1. Brush elimination and draining.

Purpose: The elimination of brush and R. petiolare from a wet site.

Method: All brush was cut, piled and immediately burned. A soggy soil condition, caused by the creek running underground, was remedied by draining the water on the area into the creek where it appeared at the surface farther below. Following the burning of the brush grass seed of the Reed canary and redtop species was sown in the ashes. When the R. petiolare bushes were removed there was considerable disturbance of the ground which provided better conditions for the establishment of grass.

The greater portion of the live stem, or 9,770 feet was eradicated before June 5 although Ribes eradication was continued at intervals. In September a good stand of Reed canary and redtop grass was visible.

CHECKING AFTER RIBES ERADICATION ON THE SAVENAC NURSERY PROTECTION AREA, HAUGAN, MONTANA

By

E. L. Joy
Junior Forester

In May a large part of the stream type within the protection area around Savenac Nursery was inspected. A small amount of checking on the three major drainages showed Ribes in the stream type as follows:

1. Savenac Creek, adjacent to the nursery; 1.2 acres in samples: 49.2 feet of live stem per acre.

2. St. Regis River, below the nursery; 1.04 acres in samples: 99.6 feet of live stem per acre.

3. Big Creek, lower end; 1.0 acre in samples; 289.6 feet of live stem per acre.

4. Big Creek, upper end; 0.38 acres in samples; 267.4 feet of live stem per acre.

During the period June 29 to July 5 the entire acreage of the protection area was checked, the upland 2 per cent and the stream type 4 per cent. The stream type had been reworked in June preceding this check.

Distribution, by types, of the acreage within the protection area is shown in Table No. 1.

TABLE NO. 1

DISTRIBUTION BY TYPE OF THE ACREAGE WITHIN THE PROTECTION AREA

Type	Acres	Per Cent
Open Reproduction	2,557.0	58.4
Dense Reproduction	270.0	6.2
Open Pole	452.0	10.3
Open Mature	16.0	0.4
Brush	94.0	2.1
Meadow	343.0	7.8
Improved	40.0	0.9
Stream	616.8	14.1
All Types	4,381.8	100.0

In Tables No. 2 and No. 3 the summaries of the checking results are shown.

TABLE NO. 2

RIBES PER ACRE BASED ON 2 PER CENT CHECK OF UPLAND TYPES

Type	Acres	Ribes Per Acre							
		R. petiolare		R. inerme		R. lacustre		All Species	
		Bushes	F.L.S.	Bushes	F.L.S.	Bushes	F.L.S.	Bushes	F.L.S.
O.M.	2,557			0.3	1.6	0.1	0.6	0.4	2.2
D.R.	170			0.2	1.1	0.2	1.1	0.4	2.2
O.P.	453							0.0	0.0
O.R.	16							0.0	0.0
Brush	94	0.5	10.6	1.1	12.5			1.6	23.4
Meadow	326			1.2	11.0			1.2	11.0
Improved	40							0.0	0.0
All Types	3,706	Trace	0.3	0.4	2.5	Trace	0.4	0.4	3.2

TABLE NO. 3

RIBES PER ACRE BASED ON 4 PER CENT CHECK OF STREAM TYPE

Stream	Acres	Ribes Per Acre							
		R. petiolare		R. inerme		R. lacustre		All Species	
		Bushes	F.L.S.	Bushes	F.L.S.	Bushes	F.L.S.	Bushes	F.L.S.
Upper St. Regis River (1 mile)	235.5	0.2	1.7	5.1	10.7	0.1	0.1	5.4	12.5
Lower St. Regis River (1 mile)	103.5							0.0	0.0
Timber Creek	38.3			5.8	28.7	2.0	24.2	6.4	[illegible]
Lower Savenac Creek (1 mile)	48.0	5.7	6.7	4.7	2.8	4.0	4.1	14.0	10.4
Upper Savenac Creek (1 mile)	55.0	6.1	21.7	34.0	210.0	0.0	0.0	40.2	232.7
Dry Creek	72.5	64.2	155.2	5.5	34.6	1.2	0.2	72.2	202.2
Holland and Cook Creeks	2.0	37.5	750.0			37.5	37.5	75.0	837.0
Big Creek	66.0	5.0	6.5	11.1	24.6	0.5	0.2	17.2	31.2
All Stream Type	618.8	9.2	24.5	6.3	31.2	0.6	2.7	16.3	58.4

That there is a very infrequent occurrence of Ribes in the upland except in the Brush and Meadow types is shown in Table No. 5. In all cases the portions of these types containing Ribes are contiguous to stream type.

Table No. 2 reveals that of the 6 areas of stream type within the protection limits, 4, containing 70 per cent of the total acreage of this type, had been worked to less than 50 feet of live stem per acre. On one of these no Ribes were found. The other 3 showed an average of 9.7 seedlings with 4.2 feet of live stem per acre and 2.6 old bushes with 11.7 feet or a total of 12.3 Ribes with 15.9 feet of live stem per acre. Thus the average seedling had 0.4 of a foot of live stem and the old bush 4.5 feet. This indicates that Ribes eradication on these areas has succeeded in reducing the Ribes population to a few small bushes per acre.

Two small unworked stream type areas of which a part of each is within the border of the mile-wide protection area were also checked. These areas, Haugan and McGee Creeks, support Ribes on the lower portion as follows:

Haugan Creek, first 20 chains containing 0.6 of an acre: 12,151 feet of live stem per acre.

McGee Creek, first 50 chains containing 1.6 acres: 24,547 feet of live stem per acre.

Because these border line concentrations are so heavy, it seems advisable to remove them as an added safety factor. The total acreage involved, probably 12 to 15 acres, is so small that the eradication task would not be great. However, the benefits derived would be immeasurable if leaving these concentrations resulted in spread of the rust to the nursery which, as shown by our studies at Cheakye, B. C., looms as a strong possibility. Another advantage which is important is that by removing all the Ribes from the entire length of these short streams, the source of Ribes seed would be destroyed.

COSTS

Checking costs for the Savenac Nursery protection area were as follows:

Salaries..................	$120.98
Transportation Expenses..	6.44
Camp Subsistence.........	30.60
Total (charged to project 4.2).........	$158.02

Checking cost per acre, $\frac{\$158.02}{4,351.8}$.... $.036

That there is a very important [illegible] upland except in the Brush and Meadow types [illegible] in all cases the [illegible] to stream type.

Table No. 3 reveals that of the [illegible] the protection limits, 4, containing 75 per cent of [illegible] this type, had been worked to less than [illegible] feet of live [illegible] one of these no Ribes were found. The other [illegible] showed [illegible] seedlings with 4.2 feet of live stem per acre and [illegible] feet or a total of 14.5 Ribes with 15.3 feet of live stem per acre. [illegible] the average seedling had 0.4 of a foot of live stem and the [illegible] feet. [illegible] in reducing the Ribes population to a few small bushes per acre.

Two small unworked stream type areas of which a part [illegible] [illegible] as follows:

Baugan Creek, first 45 chains containing 2.6 of an acre: [illegible] of live stem per acre.

[illegible] stem per acre.

Because these border line concentrations are so heavy, it seems advisable to remove them as an added safety factor. The total acreage involved, probably 12 to 15 acres, is so small that the eradication [illegible] would not be great. However, the benefits derived would be [illegible] if leaving these concentrations resulted in spread of the [illegible] [illegible] possibility. Another advantage which is important is that by removing the Ribes from the entire length of these short streams, the source of Ribes seed would be destroyed.

<u>Costs</u>

Checking costs for the Savenac Nursery protection area were as follows:

Salaries.....................$ [illegible]
[illegible]
[illegible]
Total (charged to project [illegible])..........[illegible]

Checking cost per acre [illegible]

SCOUTING FOR BLISTER RUST IN MONTANA

By

C. H. Johnson

Associate Pathologist

Scouting in northwestern Montana was conducted at intervals from early spring until the close of the season. Several members of the Spokane office assisted in the early scouting which was concentrated in the region of the Savenac Nursery.

In general, scouting on both pines and Ribes was performed in two regions of western Montana. These were:

1. The St. Regis River and its tributaries from St. Regis, Montana west to the Idaho state boundary.

2. The Missoula River and the Deer Creek, Gold Creek and Blackfoot tributaries of that river.

No evidence of infection was found on white pine, but light and scattered infections were found on Ribes in the Dry and Big Creek tributaries of the St. Regis River near the Savenac Nursery.

Infection found since 1929 on Ribes was light and seems to bear out that either spores are blowing in from the adjoining St. Joe Forest, or a light focal point of infection may exist at higher elevations somewhere in the general region of Savenac Nursery.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

BLISTER RUST CONTROL WORK IN IDAHO
1932

Blister rust control activities in Idaho were continued as a cooperative project between the Bureau of Plant Industry and the Idaho State Department of Agriculture, the Idaho State Land Board, the Idaho State Board of Forestry, the University of Idaho, the Clearwater Timber Protective Association, the Potlatch Timber Protective Association, the Coeur d'Alene Timber Protective Association, the Pend Oreille Timber Protective Association, and the Priest Lake Timber Protective Association.

The general memorandum, effective July 1, 1931 and to remain in effect indefinitely, is shown in the 1931 annual report. There are given below the amendments to the memorandum of understanding to cover the work in Idaho during the fiscal year 1933.

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective April 1, 1931
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY
and the
STATE LAND DEPARTMENT, STATE OF IDAHO

Cooperative Work in Controlling White Pine Blister Rust in Idaho.

* * * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry, and the State Land Department, State of Idaho effective April 1, 1931, to continue in effect until March 31, 1932, shall be continued in full force and effect in all its provisions for the period April 1, 1932, to March 31, 1933, with the exception of paragraphs B-5, C-1 and D, which shall be amended to read as follows:

B-5. For the period April 1, 1932, to March 31, 1933, the Federal Government in behalf of the United States Department of Agriculture, Bureau of Plant Industry will expend about $14,200.00 in connection with the work herein provided for.

C-1. Expend about $8,000.00 upon this cooperative project for the period April 1, 1932, to March 31, 1933. This contribution to be paid into the Treasury of the United States, in such installments and at such times as the Bureau of Plant Industry considers necessary for the proper prosecution of the work, and to be disbursed by the properly authorized officials of the Bureau of Plant Industry.

[illegible]
1953

Blister rust control activities in Idaho were continued as a cooperative project between the Bureau of Plant Industry, the Idaho State Department of Agriculture, the Idaho State Land Board, the Idaho State Board of Forestry, the University of Idaho, the Clearwater Timber Protective Association, the Potlatch Timber Protective Association, the Coeur d'Alene Timber Protective Association, the Pend Oreille Timber Protective Association, and the Priest Lake Timber Protective Association.

The general memorandum, effective July 1, 1951 and to remain in effect indefinitely, is shown in the 1951 annual report. There are given below the amendments to the memorandum of understanding to cover the work in Idaho during the fiscal year 1953.

AMENDMENT [illegible]
MEMORANDUM OF UNDERSTANDING
(Effective April 1, 1951)
Between
UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY
and the
STATE LAND DEPARTMENT, STATE OF IDAHO

Cooperative Work in Controlling White Pine Blister Rust in Idaho.

* * * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry, and the State Land Department, State of Idaho effective April 1, 1951, to continue in effect until March 31, 1955, shall be continued in full force and effect in all its provisions for the period April 1, 1952 to March 31, 1953, with the exception of paragraphs B-5, C-1 and [illegible], which shall be amended to read as follows:

B-5. For the period April 1, 1952, to March 31, 1953, the Federal Government in behalf of the United States Department of Agriculture, Bureau of Plant Industry will expend about $[illegible] in connection with the work herein provided for.

C-1. Expend about $8,000.00 upon this cooperative project for the period April 1, 1952 to March 31, 1953. This contribution to be paid into the Treasury of the United States, in such installments and at such times as the Bureau of Plant Industry considers necessary for the proper prosecution of the work, and to be witnessed by authorized officials of the Bureau of Plant Industry.

8. For the period stated above, this cooperative control work shall be performed in working units 12 and 11, in the vicinity of Priest Lake, Idaho.

The undersigned also mutually agree that this memorandum shall take effect April 1, 1932, and continue in effect until March 31, 1933, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

Adrian Nelson, Jr.

Ben C. Bush
State Land Department, State of Idaho.

Jan. 9, 1932

Wm. A. Taylor
Chief, Bureau of Plant Industry, U. S. D. A.

4. For the period stated above, this [illegible] shall be performed in working units 10 and 11, in the vicinity of Teller Lake, Idaho.

The undersigned also mutually agree that this agreement shall take effect April 1, [illegible], and continue in effect until [illegible], provided that either party may terminate the agreement at any time by written statement to that effect [illegible] days in advance of the date of termination.

Adrian Nelson, Jr. [illegible]

Jan. 6, 19[illegible] [illegible]

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective April 1, 1931,
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY
and the
UNIVERSITY OF IDAHO

Cooperative Work in Controlling White Pine Blister Rust in Idaho.

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry, and the University of Idaho effective April 1, 1931, to continue in effect until March 31, 1932, shall be continued in full force and effect in all its provisions for the period April 1, 1932 to March 31, 1933, with the exception of paragraphs B-2, C-5 and D-3, which shall be amended to read as follows:

B-2. For the period April 1, 1932 to March 31, 1933 the Federal Government in behalf of the United States Department of Agriculture, Bureau of Plant Industry will expend about $11,900.00 in the development of methods of blister rust control suitable to forest conditions in north Idaho.

C-5. Expend about $4,000.00 upon this cooperative project for the period April 1, 1932 to March 31, 1933.

D-3. That this memorandum of understanding shall take effect April 1, 1932 and continue in effect until March 31, 1933, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

Dec. 9, 1932 F. G. Miller
University of Idaho.

Dec. 28, 1932 Wm. A. Taylor
Chief, Bureau of Plant Industry, U. S. D. A.

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective April 1, 1931
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY
and the
CLEARWATER TIMBER PROTECTIVE ASSOCIATION

Cooperative Work in Controlling White Pine Blister Rust in Idaho.

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry, and the Clearwater Timber Protective Association effective April 1, 1931, to continue in effect until March 31, 1932, shall be continued in full force and effect in all its provisions for the period April 1, 1932, to March 31, 1933, with the exception of paragraphs B-5, C-1 and D, which shall be amended to read as follows:

B-5. For the period April 1, 1932, to March 31, 1933, the Federal Government in behalf of the United States Department of Agriculture, Bureau of Plant Industry will expend about $18,800 in connection with the work herein provided for.

C-1. Expend about $10,000.00 upon this cooperative project for the period April 1, 1932, to March 31, 1933. This contribution to be paid into the Treasury of the United States, in such installments and at such times as the Bureau of Plant Industry considers necessary for the proper prosecution of the work and to be disbursed by the properly authorized officials of the Bureau of Plant Industry.

D. For the period stated above this cooperative control work shall be carried on in working units 1, 4 and 10.

The undersigned also mutually agree that this memorandum shall take effect April 1, 1932, and continue in effect until March 31, 1933, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

April 14, 1933 — C. L. Billings, President
Clearwater Timber Protective Association.

April 22, 1933 — Wm. A. Taylor,
Chief, Bureau of Plant Industry, U. S. D. A.

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective April 1, 1931
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY
POTLATCH FORESTS, INC., MILWAUKEE LAND COMPANY
AND THE STATE LAND DEPARTMENT, STATE OF IDAHO

Cooperative Work in Controlling White Pine Blister Rust in Idaho.

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry, Potlatch Forests, Inc., Milwaukee Land Company and the State Land Department of the State of Idaho effective April 1, 1931, to continue in effect until March 31, 1932, shall be continued in full force and effect in all its provisions for the period April 1, 1932 to March 31, 1933, with the exception of paragraphs B-5, C-1, D-1, E-1 and F, which shall be amended to read as follows:

B-5. For the period April 1, 1932, to March 31, 1933 the Federal Government, in behalf of the United States Department of Agriculture, Bureau of Plant Industry, will expend about $2,100.00 in connection with the work herein provided for.

C-1. Expend about $500.00 on this cooperative project for the period April 1, 1932 to March 31, 1933. This contribution to be paid into the Treasury of the United States, in such installments and at such times as the Bureau of Plant Industry considers necessary for the proper prosecution of the work, and to be disbursed by the properly authorized officials of the Bureau of Plant Industry.

D-1. Expend about $500.00 on this cooperative project for the period of April 1, 1932 to March 31, 1933. This contribution to be paid into the Treasury of the United States, in such installments and at such times as the Bureau of Plant Industry considers necessary for the proper prosecution of the work, and to be disbursed by the properly authorized officials of the Bureau of Plant Industry.

E-1. Expend about $200.00 on this cooperative project for the period April 1, 1932 to March 31, 1933. This contribution to be paid into the Treasury of the United States, in such installments and at such times as the Bureau of Plant Industry considers necessary for the proper prosecution of the work, and to be disbursed by the properly authorized officials of the Bureau of Plant Industry.

[illegible]

[illegible]

Effective April 1, 1931

between

[illegible]

[illegible]

[illegible]

Cooperative Work in Controlling White Pine Blister Rust in Idaho.

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry, Potlatch Forests, Inc., Milwaukee Land Company and the State Land Department of the State of Idaho effective April 1, 1931, to continue in effect until March 31, 1932, shall be continued in full force and effect in all its provisions for the period April 1, 1932 to March 31, 1933, with the exception of paragraphs E-5, G-1, H-1, I-1 and J-1, which shall be amended to read as follows:

E-5. For the period April 1, 1932, to March 31, 1933 the Federal Government, in behalf of the United States Department of Agriculture, Bureau of Plant Industry, will expend about $[illegible] in connection with the work herein provided for.

G-1. Expend about $500.00 on this cooperative project for the period April 1, 1932 to March 31, 1933. This contribution to be paid into the Treasury of the United States, in such installments and at such times as the Bureau of Plant Industry considers necessary for the proper prosecution of the work, and to be disbursed by the properly authorized officials of the Bureau of Plant Industry.

H-1. Expend about $[illegible] on this cooperative project for the period of April 1, 1932 to March 31, 1933. This contribution to be paid into the Treasury of the United States, in such installments and at such times as the Bureau of Plant Industry considers necessary for the proper prosecution of the work, and to be disbursed by the properly authorized officials of the Bureau of Plant Industry.

I-1. Expend about $200.00 on this cooperative project for the period April 1, 1932 to March 31, 1933. This contribution to be paid into the Treasury of the United States, in such installments and at such times as the Bureau of Plant Industry considers necessary for the proper prosecution of the work, and to be disbursed by the properly authorized officials of the Bureau of Plant Industry.

The undersigned also mutually agree that this memorandum of understanding shall take effect April 1, 1932 and continue in effect until March 31, 1933, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

__________	G. F. Jewett, Treasurer Potlatch Forests, Inc.
__________	C. H. Sanderson, General Manager Milwaukee Land Company
__________	Ben E. Bush, State Forester State Land Department, State of Idaho.
Jan. 13, 1933	Wm. A. Taylor Chief, Bureau of Plant Industry, U. S. D. A.

RIBES ECOLOGY IN THE INLAND EMPIRE
By
Charles W. Waters
Agent

INTRODUCTION

During the past season the Ribes ecology studies have been of necessity considerably narrowed in their scope and, unfortunately, little or no opportunity has been given to continue investigations along the lines which have seemed in the past to be very vital to a better and clearer understanding of the control program. Due to this unfortunate situation such plans as have been laid in the past for an intensive and unified program of ecological investigation have been, it is hoped, only temporarily abandoned, and in their place have been substituted certain general field studies which seemed, after careful deliberation, to be of the most immediate importance. The cutting down of the field personnel has made such studies exceedingly limited in their nature, but nevertheless from results obtained during the past season it is felt that some important data have been secured which may have some influence in directing the future progress of the control program.

The period since the last report has seen the continuation of the Seed Storage Studies which were initiated in 1930 and carried on in the blister rust laboratory at the University of Idaho by Mr. D. F. Miller.

The methods and results of this study as well as the others will be taken up individually as follows:

A. Seed Storage Study.
B. Study of Effects of Cutting Methods on Ribes Seed Germination and Seedling Survival.
C. Effects of Closing-in of the Forest Canopy on Upland Ribes.

A. SEED STORAGE STUDY.

Purpose

The general purpose of this study has already been outlined on page 47 of the 1931 Annual Report. The results of Mr. Miller's work, together with his methods, are herewith presented.

RIBES ECOLOGY IN THE [illegible]

By

Charles W. [illegible]

[illegible]

INTRODUCTION

During the past season the Ribes ecology studies have been of necessity considerably curtailed in their scope and [illegible] little or no opportunity has been given to continue investigations along lines which have seemed in the past to be very vital to a fuller and clearer understanding of the control program. [illegible] situation such plans as have been laid in the past for an intensive and unified program of ecological investigation have been [illegible] temporarily abandoned, and in their place have been substituted certain general field studies which seemed, after careful deliberation, to be of the most immediate importance. [illegible] made such studies exceedingly limited in their nature, but nevertheless from results obtained during the past season it is felt that some important data have been secured which may have some influence in directing the future progress of the control program.

The period since the last report has seen the continuation of the Seed Storage Studies which were initiated in 1930 and carried on in the blister rust laboratory at the University of Idaho by Mr. [illegible].

The methods and results of this study as well as [illegible] will be taken up individually as follows:

A. Seed Storage Study.
B. Study of Effects of Cutting Methods on Ribes Seed Germination and Seedling Survival.
C. Effects of Closing-in of the Forest Canopy on [illegible] Ribes.

A. SEED STORAGE STUDY

Purpose

The general purpose of this study has already been outlined on page 47 of the 1930 Annual Report. The results of Mr. [illegible]'s work, together with his methods, are herewith presented.

Germination Study of Ribes Seeds Stored in the Duff

D. R. Miller,
Junior Forester

INTRODUCTION

The purpose of this study was to germinate all the seeds contained in each of the duff samples which were collected throughout the white pine belt of northern Idaho during the summer of 1931 (see the ecological portion of the annual reports for 1930 and 1931), and to identify each seedling as being either a Ribes or not a Ribes. The identity of each seedling was kept by area and block so that the results could be tabulated.

The samples had been sifted and screened until a volume of from five to twenty-five cubic centimeters of particles similar in size to Ribes seeds were left from each original sample. These were placed in small vials and to prevent them from drying out a few drops of distilled water were added to each sample. As soon as these vials were received at the laboratory they were placed in a 5° C. temperature chamber where they remained until the samples were planted.

There were 742 duff samples. The germination chambers would not handle this amount at one time, consequently two runs were necessary; 372 samples were run in the first set and 370 in the second. In dividing the samples for the two runs the A, B, and C samples which represent the upper, middle and lower layers of duff, respectively, were retained as even in number as possible for each area. This procedure kept the two sets of samples comparable.

PROCEDURE OF FIRST SET

Dipping of samples

The samples were dipped in a weak sulphuric acid solution to stimulate germination. A special dipping pan was necessary to speed up the process and at the same time make it possible to remove the dipped sample from the dipper without using more water for washing adhering particles from the walls than that needed for moistening the sand medium upon which the sample was germinated. The dipper is made of sheet copper and soldered with a pure tin solder to avoid undesirable corrosive effects. It consists of a short section of a cylinder 1.25 inches deep and 2.5 inches in diameter, with walls turned in at the lower end to support a false bottom. The false bottom is a 40-mesh copper screen disc soldered on a flat copper ring whose outer diameter is slightly less than that of the inside of the dipper. The screen comes flush with the outer edge of the ring insuring a tight fit and, in addition, giving a flat

[illegible]

[illegible]

D. R. Miller,

[illegible]

[illegible]

The purpose of this study was to germinate all the seeds contained in each of the duff samples which were collected throughout the white pine belt of northern Idaho during the summer of 1951 (see the ecological portion of the annual reports for 1950 and 1951), and to identify each seedling as being either a Ribes or not a Ribes. The identity of each seedling was kept by area and block so that the results could be tabulated.

The samples had been sifted and screened until a volume of from five to twenty-five cubic centimeters of particles similar in size to Ribes seeds was left from each original sample. These were placed in small vials and to prevent them from drying out a few drops of [illegible] water were added to each sample. As soon as these vials were received at the laboratory they were placed in a 5° C. temperature chamber where they remained until the samples were planted.

There were 748 duff samples. The germination chambers would not handle this amount at one time, consequently the test was run in two sets; 377 samples were run in the first set and 371 in the second. In dividing the samples for the two runs the A, B, and C samples which represent the upper, middle and lower layers of duff, respectively, were selected as even in number as possible for each area. This procedure kept the two sets of samples comparable.

[illegible]

Dipping of samples

The samples were dipped in a weak sulphuric acid solution to stimulate germination. A special dipping pan was necessary to speed up the process and at the same time make it possible to remove the dipped sample from the dipper without using more water for washing off the particles from the walls than that needed for moistening the seed medium upon which the sample was germinated. The dipper is made of [illegible] and soldered with a [illegible] to avoid [illegible] effects. It consists of a short section of a cylinder [illegible] inches deep and 2.5 inches in diameter, with walls turned in at the lower end to support a false bottom. The false bottom is a 40-mesh copper screen disc soldered to a flat copper ring whose outer diameter is slightly less than that of the inside of the dipper. The screen comes flush with the outer edge of the ring insuring a tight fit and, in addition, giving a flat

surface which can be scraped clean with a spatula. A spring wire ring, with one end bent up and in to facilitate its handling, is used inside the dipper to keep the false bottom in place. The lid is a copper disc slightly larger in diameter than the dipper and has a circular band soldered on its underside which holds it in place by friction. The dipper is equipped with a 7-inch straight handle while the lid has a staple-shaped handle soldered on its top.

Each sample was placed in a dipper and then immersed in a 4 per cent solution of sulphuric acid for five minutes. The seeds of the species of Ribes which were expected to be present in the samples preferred a 2 to 10 per cent solution of sulphuric acid as a germination stimulant. As the seeds may have remained in the duff from one to several years, the seed coats would be materially weakened by decomposition, thus making them more permeable to the acid. The 4 per cent solution was used because it was thought that this concentration would be strong enough to stimulate germination but would not be strong enough to injure the embryos of the less protected seeds. The dipper was splashed about in the solution to insure a thorough soaking of the entire sample. At the end of the five minutes, the sample was drained for a few seconds and, after being washed with distilled water, was placed in a 0.2 per cent solution of potassium bicarbonate. It remained there for about a minute; then it was washed again with distilled water. The potassium bicarbonate bath was used to neutralize any acid that might have adhered to the seeds after the sample was washed. This completed the dipping process.

Germination conditions.

The samples, after being dipped, were placed in petri dishes on sterilized sand which had been saturated with distilled water. The dishes were then stored in the 10° C. temperature chamber until all the samples were planted. A period of 48 hours was allowed to elapse from the time the last sample was planted until the set was placed in the alternating temperature combination. This delay allowed the seeds to become thoroughly plumped before germination was attempted.

The 25° C. day and 5° C. night temperature combination was used because the seeds of the Ribes species which were expected to be present preferred this combination. The samples remained in incubation for 4 months giving them one month longer than is usually allowed for germination.

Care of seedlings.

The seedlings were transplanted to specially prepared dishes as soon as they were germinated. (It was not always possible to transplant them immediately and sometimes they were a week old before the transfer was made.) Each sample in the chambers had a corresponding transplant dish.

surface which can be scraped clean with a spatula. A [illegible] wire clip, with one end bent up and in to [illegible], is used inside the dipper to keep the [illegible] in place. The lid [illegible] slightly larger in diameter than the dipper and has a [illegible] soldered on its underside which holds it in place by friction. The dipper is equipped with a 7-inch straight handle while the lid has a [illegible] shaped handle soldered on its top.

Each sample was placed in a dipper and then immersed in a 4 per cent solution of sulphuric acid for five minutes. The seeds of the species of Elymus which were expected to be present in the samples preferred a 2 to 10 per cent solution of sulphuric acid as a germination stimulant. As the seeds may have remained in the duff from one to several years, the seed coats would be materially weakened by decomposition, thus making them more permeable to the acid. The 4 per cent solution was used because it was thought that this concentration would be strong enough to stimulate germination but would not be strong enough to injure the embryos of the less protected seeds. The dipper was agitated while in the solution to insure a thorough soaking of the entire sample. At the end of the five minutes, the sample was drained for a few seconds and, after being washed with distilled water, was placed in a [illegible] per cent solution of potassium permanganate. It remained there for [illegible] minutes. Then it was washed again with distilled water. The potassium permanganate was used to neutralize any acid that might have adhered to the seeds after the sample was washed. This completed the dipping process.

Germination conditions.

The samples, after being dipped, were placed in metal dishes on sterilized sand which had been saturated with distilled water. The dishes were then stored in the 10° C. temperature chamber until all the samples were planted. A period of 48 hours was allowed to elapse from the time the last sample was planted until the set was placed in the alternating temperature combination. This delay allowed the seeds to become thoroughly [illegible] before germination was attempted.

The 25° C. day and 5° C. night temperature combination was used because the seeds of the Elymus species which were expected to be present preferred this combination. The samples remained in incubation for [illegible] months during which time [illegible] longer than is usually allowed for germination.

Care of seedlings.

The seedlings were transplanted to specially prepared dishes as soon as they were germinated. (It was not always possible to transplant them immediately, but sometimes they were a week old before the transfer was made.) Each sample in the chambers had a corresponding transplant dish.

This was done to prevent the seedlings from losing their identity. The transplant dishes contained four grams of air-dried peat which had been neutralized with calcium carbonate. The seedlings were watered with distilled water and at intervals a few drops of 1/2 Hoagland nutrient solution were added. It was necessary to make a special transfer rack with trays to facilitate the handling of so many dishes. The peak of germination was reached during the second week of incubation and gradually decreased until practically no germination was occurring when the set was discontinued.

A heavy mortality occurred among the seedlings following transplanting. This mortality was probably due to several factors. Many of the seedlings were of species which are very delicate and these would not stand the shock of being transplanted. Some of the seedlings were injured when transferred or during the care which followed. In one case too much nutrient solution was added thus taking a heavy toll. Damping-off caused most trouble during the first part of the run as there was little, if any, sunlight. Later some sunlight was available nearly every day and just before the run was ended this was augmented by a powerful electric light. Damping-off under those conditions still caused some mortality but only a small fraction of its previous damage.

The surviving seedlings were grown until they were large enough to identify as being either Ribes or not Ribes. This could usually be done after the first or second pair of leaves appeared. The growth of the Ribes seedlings was continued until they were large enough to be identified by species. Some of these identified seedlings were pressed so as to have a permanent record or check, but they were too succulent and little remained after drying. The balance were then put in a preservative solution and although this decolorizes them, they are still satisfactory for identification purposes.

PROCEDURE OF SECOND SET

Germination process.

The entire dipping process and the germinating conditions used in the first set appeared to be satisfactory, as germination occurred in more than 70 per cent of the dishes. This statement is justified in that the contents of several of the dishes in which germination had ceased, or had never occurred, were carefully examined under a hand lens and few, if any, seeds were found.

Care of seedlings.

To insure better results in the second set than were obtained in the first, several modifications for the care of the seedlings after germination were made. They are as follows:

This was done to prevent the seedlings from losing their identity. The transplants dishes contained four grams of air-dried peat which had been neutralized with calcium carbonate. The seedlings were watered with distilled water and at intervals a few drops of Hoagland's nutrient solution were added. It was necessary to make a special transfer rack with trays to facilitate the handling of so many dishes. The peak of germination was reached during the second week of incubation and gradually decreased until practically no germination was occurring, when the set was discontinued.

A heavy mortality occurred among the seedlings following transplanting. This mortality was probably due to several factors. Many of the seedlings were of species which are very delicate and these could not stand the shock of being transplanted. Some of the seedlings were injured when transferred or during the care which followed. In one case too much nutrient solution was added thus causing a heavy kill. Damping-off caused much trouble during the first part of the run as there was little, if any, sunlight. Later some sunlight was available nearly every day and just before the run was ended this was augmented by a powerful electric light. Damping-off under these conditions still caused some mortality but only a small fraction of the previous amount.

The surviving seedlings were grown until they were large enough to identify as being either Abies or not Abies. This could usually be done after the first or second pair of leaves appeared. The growth of the Abies seedlings was continued until they were large enough to be identified by species. Some of these identified seedlings were pressed so as to have a permanent record of them, but they were too succulent and little remained after drying. The balance were then put in a preservative solution and although this decolorized them, they are still satisfactory for identification purposes.

[illegible]

Germination studies

The entire dipping process and the germinating conditions used in the first set appeared to be satisfactory, as germination occurred in more than 70 per cent of the dishes. This statement is justified in that the contents of several of the dishes in which germination did not occur, or had never occurred, were carefully examined under a hand lens and few, if any, seeds were found.

Care of seedlings

To lessen mortality results in the second set like those obtained in the first, several modifications for the care of the seedlings after germination were made. They are as follows:

1. A mixture of three parts (by weight) of peat which had been neutralized with calcium carbonate and two parts of fine sand, were used as a transplant medium. These were thoroughly mixed and then placed in the autoclave for 90 minutes at 15 pounds pressure. This was to kill any foreign seeds that might be present. After sterilization four ounces of Ansul's formaldehyde dust was added to each cubic foot of medium. Forty-eight hours elapsed before the medium was used to allow it to become thoroughly saturated with the fumes from the dust. The fumes are toxic to damping-off fungi and helped to prevent their spread and growth. Sand was added to the medium to make it more porous. Peat, when used alone, packed down and prevented proper root aeration.

2. Twice as much medium was used in the transplant dishes as was used in the first set. Enough distilled water was added to saturate the medium and then from 50 to 55 grams of the mixture were placed in a petri dish pressing it flat with the thumbs. This greater amount of medium helped to prevent excessive drying and at the same time permitted better root development.

3. The seedlings were transplanted the day the radicle appeared. (In the first set they were sometimes allowed to remain in the germination dish a week before being transplanted.) It was found that there was less danger of injury at this time as they could be handled by the seed coat with a pair of tweezers. The seedlings would become extremely succulent if allowed to remain in the germination dishes for more than 2 or 3 days, and were subject to serious drying out when transplanted to an open dish.

4. When the first seedlings were placed in a transplant dish, one cubic centimeter of 1/2 Hoagland nutrient solution was added because the medium does not contain any plant food. Then, in order to keep plant food available, the seedlings were watered at 2-week intervals with 1/40th Hoagland solution containing four parts of ferric citrate per million parts of solution. This method prevented a concentration of salts in the dishes, thereby eliminating mortality from this source. The seedlings were watered twice daily using just enough distilled water to saturate the medium.

5. The young plants were given a few hours of sunlight or its equivalent each day. When the sun was shining, the rack containing the trays of seedlings was placed in the sunshine. A strong electric lamp of from 300 to 500 watts furnished the necessary light on cloudy days. Sunlight not only aids in the manufacture of plant food but also retards the growth of injurious molds on the medium.

As a result of these changes, more than four times as many seedlings survived until they were 3 to 4 months old than had lived in the previous set.

IDENTIFICATION

Seeds of the four common species of Ribes found in northern Idaho, namely, R. *viscosissimum*, R. *lacustre*, R. *inerme* and R. *petiolare* were germinated along with the duff samples. These seedlings were used in identifying the unknown plants from the duff samples as being Ribes or not being Ribes. This method of identification left little doubt as to the identity of a plant called a Ribes.

Miss Ruth Remsberg of the University of Idaho helped to make the identifications of the second set of seedlings.

RESULTS

Table No. 1 shows the total number of seedlings germinated in the two sets by age class of the timber stands and by duff layers. The number of samples collected from each duff layer were equal. There were, roughly, from five to ten times as many seedlings germinated from the B layer as from the A layer. And, in turn, there were about five to ten times as many seedlings germinated from the C layer as from the B layer. This might be an indication of the ratio of distribution of seeds which would normally occur in each duff layer. As would be expected, the number of seedlings germinated from each timber age class decreases as the age of the stand increases.

An analysis of Table No. 2 shows that: (1) Ribes seeds were present in most of the timber age classes since seedlings were obtained from the 20-40 age class to the 200+ age class. There were two age classes in which no Ribes germinated. (2) The ratio between the numbers of Ribes found in the different layers of duff is similar to that between the numbers of all seedlings germinated.

An analysis of Table No. 3 shows that: (1) about 90 per cent of all the seedlings germinated were in the C layer of duff, over 8 per cent were in the B layer, and only 1 per cent was in the A layer. (2) About 81 per cent of the Ribes came from the C layer of duff, 17 per cent from the B layer, and 2 per cent from the A layer. (3) Of all the seedlings, 3.42 per cent were Ribes.

Table No. 4 gives the percentages of all seedlings and of Ribes seedlings that occurred in each age class of the timber stands represented. These cannot be compared directly as there were collections from more areas in some age classes than in others and, at the same time, the number of 8-inch blocks varied for some of the areas. There is, however, a general trend for the percentages to decrease as the stands increase in age.

Table No. 5 gives the number of areas sampled in each timber age

IDENTIFICATION

Seeds of the four common species of Ribes found in northern Idaho, namely, R. viscosissimum, R. lacustre, R. inerme and R. petiolare were germinated along with the duff samples. These seedlings were used in identifying the unknown plants from the duff samples as being Ribes or not being Ribes. This method of identification left little doubt as to the identity of a plant being a Ribes.

Miss Ruth [illegible] of the University of Idaho helped to make the identifications of the unusual and odd seedlings.

RESULTS

Table No. 1 shows the total number of seedlings germinated in the two sets by age class of the timber stands and by duff layers. The number of samples collected from each duff layer was equal. There were, roughly, from five to ten times as many seedlings germinated from the B layer as from the A layer. And, in turn, there were about five to ten times as many seedlings germinated from the C layer as from the B layer. This might be an indication of the ratio of distribution of seeds which would normally occur in each duff layer. As would be expected, the number of seedlings germinated from each layer decreases as the age of the stand increases.

An analysis of Table No. 2 shows that: (1) Ribes seeds were present in most of the timber age classes since seedlings were obtained from the 20-40 age class to the 300+ age class. There were few age classes in which no Ribes germinated. (2) The ratio between the numbers of Ribes found in the different layers of duff is similar to that between the numbers of all seedlings germinated.

An analysis of Table No. 3 shows that: (1) about 90 per cent of all the seedlings germinated were in the C layer of duff, about 9 per cent were in the B layer, and only 1 per cent was in the A layer. (2) About 82 per cent of the Ribes came from the C layer of duff, 17 per cent from the B layer, and 1 per cent from the A layer. (3) Of all the seedlings, 2.4 per cent were Ribes.

Table No. 4 gives the percentages of all seedlings and of Ribes seedlings that occurred in each age class of the timber stands respectively. These cannot be compared directly as there were collections from more areas in some age classes than in others and, at the same time, the number of 6-inch blocks varied for some of the areas. There is, however, a general trend for the percentages to decrease as the stands increase in age.

Table No. 5 gives the number of areas sampled in each timber age

class and the number of 6-inch samples or blocks from these areas. The areas of the blocks are converted into milacres and then the total number of seedlings and Ribes are computed on an acreage basis. The number of Ribes per acre varies from 33,429 in the 20-40-year-old stands down to 2,176 in the 200-year-old stands. This indicates that for stands up to 200 years old there are still viable Ribes seeds to be found in the duff. As the age of the timber stands increases there is an almost uniform decrease in the number of seedlings per acre.

All logged areas, regardless of the age class of the original stands, were computed together even though the duff samples were collected from Ribes-free portions and apparently represented these stands. The separation of the logged lands or this age class (as none of the areas had been logged more than 20 years, they were grouped under logged) was made so that the results of the entire study could not be contested on the grounds that the cut-over lands were not representative of the original stands and therefore the data were not comparable. Any veteran Ribes bushes that might be in a stand usually fruit the first or second year following logging, hence there was a possibility of new seeds being disseminated before the duff samples were collected, even though the area appeared to be free of Ribes. The cut-over lands represented age classes of from 100 to 200 years old and, as only a few Ribes were germinated, it indicates that they did closely represent the original stands.

SUMMARY

The laboratory portion of the germination study of Ribes stored in the duff, which was conducted at Moscow, Idaho during the winter of 1931-1932, has provided the following information:

1. The method of dipping and the 4 per cent solution of sulphuric acid which was used as a stimulating bath, were satisfactory as good germination was secured in most of the dishes containing seeds.

2. The method of caring for the seedlings following germination, as conducted for the second set, gave good results since about 1,200 out of 1,628 seedlings, regardless of species, survived until they were three months old.

3. For the total number of seedlings, as well as the number of Ribes seedlings, from 81 to 90 per cent were in the C layer of duff, from 8 to 16 per cent in the B layer and from 1 to 2 per cent were in the A layer.

4. Viable Ribes seeds were present in the duff of timber stands as old as 200 years.

5. The total number of viable seeds as well as the number of viable Ribes seed present in the duff decreased as the age of the timber stand increased.

class and the number of 3-inch samples of blocks from these areas. The areas of the blocks are converted [illegible] and the [illegible] number of seedlings and Ribes are computed on an acreage basis. The number of Ribes per acre varies from 33,429 in the 20-40-year-old stands down to 3,572 in the 300-year-old stands. This indicates [illegible] stands up to 300 years old there are still viable Ribes seeds [illegible]. As the age of the timber stands increases there is an [illegible] decrease in the number of seedlings per acre.

All logged areas, regardless of the age class of the original stands, were [illegible] together even though the duff samples [illegible] from Ribes-free portions and apparently represented [illegible] stands. The separation of the logged lands or this age class (as none of the areas had been logged more than 30 years, they were [illegible]) was made so that the results of the entire study could not be contested on the grounds that the cut-over lands were not representative of [illegible] stands and therefore the data were not comparable. Any [illegible] bushes that might be in a stand usually fruit the first or second year following logging, hence there was a possibility of new seeds [illegible] dissemination before the duff samples were collected, even though the area appeared to be free of Ribes. The cut-over lands represented age classes of from 100 to 300 years old and, as only a few Ribes were germinated, it indicates that they did closely represent the [illegible] stands.

SUMMARY

The laboratory portion of the germination study of Ribes seeds in the duff, which was conducted at Moscow, Idaho during the winter of 1951-1952, has provided the following information.

1. The method of [illegible] and the [illegible] which was used as a [illegible] was satisfactory [illegible] germination was secured in most of the [illegible] seeds.

2. The method of caring for the seedlings following germination, as [illegible] and [illegible] 1,[illegible] seedlings, regardless of species [illegible] months old.

3. For the total number of seedlings, as well as the number of Ribes seedlings, from 81 to 90 per cent were in the C layer of duff, from 8 to 16 per cent in the B layer and from 1 to 2 per cent were in the A layer.

4. Viable Ribes seeds were present in the duff of [illegible] as old as 300 years.

5. The total number of viable seeds as well as the number of viable Ribes seed present in the duff [illegible] as the age of the timber stand increased.

6. As so many seedlings died before they could be identified, especially in the first set, the number of Ribes germinated is on the conservative side.

TABLE NO. 1

TOTAL GERMINATION FROM DUFF SAMPLES

Age Class of Timber Stands	Germination by Duff Layer											
	First Set				Second Set				Total			
	A	B	C	Total	A	B	C	Total	A	B	C	Total
20-40 years	7	81	700	788	3	33	690	726	10	114	1,390	1,514
41-60 years	2	24	395	421	1	6	159	166	3	30	554	587
61-80 years	9	30	172	211	-	20	147	167	9	50	319	378
81-100 years	-	23	85	108	1	11	115	127	1	34	200	235
101-150 years	4	18	108	130	-	5	163	168	4	23	271	298
151-200 years	7	-	152	159	-	23	158	181	7	23	310	340
200+ years	-	5	18	23	-	6	30	36	-	11	48	59
Logged (less than 20 years ago)	1	1	35	37	2	15	40	57	3	16	75	94
Totals	30	182	1,665	1,877	7	119	1,502	1,629	37	301	3,167	3,506

TABLE NO. 2

TOTAL GERMINATION FROM DUFF SAMPLES

Age Class of Timber Stands	Germination by Duff Layer															
	A				B				C				Total			
	R. inr.	R. lac.	R. vis.	Total	R. inr.	R. lac.	R. vis.	Total	R. inr.	R. lac.	R. vis.	Total	R. inr.	R. lac.	R. vis.	Total
Part A (First Set)																
20-40 yrs.			2	2			6	6		-	13	13		-	21	21
41-60 yrs.			1	1			-	-		-	8	8		-	9	9
61-80 yrs.			-	-			-	-		-	-	-		-	-	-
81-100 yrs.			-	-			2	2		-	1	1		-	3	3
101-150 yrs.			-	-			-	-		-	-	-		-	-	-
151-200 yrs.			-	-			-	-		-	5	5		-	5	5
200+ yrs.			-	-			-	-		-	1	1		-	1	1
Logged (less than 20 yrs. ago)			-	-			-	-		1	-	1		1	-	1
Totals			3	3			8	8		1	28	29		1	39	40
Part B* (Second Set)																
20-40 yrs.					-	1	7	8	-	10	19	29	-	11	26	27
41-60 yrs.					-	-	-	-	-	2	10	12	-	2	10	12
61-80 yrs.					-	-	-	-	-	-	-	-	-	-	-	-
81-100 yrs.					-	-	-	-	1	4	2	7	1	4	2	7
101-150 yrs.					-	-	-	-	-	-	-	-	-	-	-	-
151-200 yrs.					-	-	3	3	-	1	17	18	-	1	20	21
200+ yrs.					-	-	-	-	-	-	-	-	-	-	-	-
Logged (less than 20 yrs. ago)					-	1	-	1	-	2	-	2	-	3	-	3
Totals					-	2	10	12	1	19	48	68	1	21	58	80
Total																
20-40 yrs.	-	-	2	2	-	1	13	14	-	10	32	42	-	11	47	58
41-60 yrs.	-	-	1	1	-	-	-	-	-	2	18	20	-	2	19	21
61-80 yrs.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
81-100 yrs.	-	-	-	-	-	-	2	2	1	4	3	8	1	4	5	10
101-150 yrs.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
151-200 yrs.	-	-	-	-	-	-	3	3	-	1	22	23	-	1	26	26
200+ yrs.	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1	1
Logged (less than 20 yrs. ago)	-	-	-	-	-	1	-	1	-	3	-	3	-	4	-	4
Totals	-	-	3	3	-	2	18	20	1	20	76	97	1	22	97	120

*No germination occurred in the A or top layer of duff.

TABLE NO. 3

PERCENTAGE OF GERMINATION BY DUFF LAYER

Classification	Duff Layer A	B	C	Total
All seedlings	1.06	8.59	90.35	100.0
Ribes	2.50	16.67	80.83	100.0
Percentage of Total Seedlings that were Ribes	0.086	0.571	2.767	3.424

TABLE NO. 4

PERCENTAGE OF GERMINATION BY AGE CLASS OF TIMBER STANDS

Age Class of Timber Stands	Classification: All Seedlings	Ribes	Per Cent of Total that were Ribes
20-40 yrs.	43.21	45.44	1.555
41-60 yrs.	16.75	17.50	.599
61-80 yrs.	10.78	-	-
81-100 yrs.	6.70	8.33	.285
101-150 yrs.	8.50	-	-
151-200 yrs.	9.70	21.67	.742
200+ yrs.	1.66	0.83	.028
Logged (less than 20 yrs. ago)	2.66	3.33	.114
Totals	100.00	100.00	3.424

TABLE NO. 6

SEEDLINGS GERMINATED--ON ACREAGE BASIS

Age Class of Timber Stands	Areas, Blocks, Milacres and Seedlings by Age Class: Areas For each Age Class	Blocks Col-lected	Mil-acres Col-lected	Seed-lings Germi-nated	Seed-lings Germi-nated Per Acre	Ribes Germi-nated	Ribes Germi-nated Per Acre
20-40 yrs.	19	170	1.725	1,514	372,082	58	33,429
41-60 yrs.	10	85	0.867	587	677,047	21	24,221
61-80 yrs.	7	70	0.714	775	639,412	-	-
81-100 yrs.	10	88	0.867	235	271,050	10	11,534
101-150 yrs.	8	80	0.816	296	356,196	-	-
151-200 yrs.	13	115	1.174	340	289,600	26	22,147
200+ yrs.	5	45	0.459	59	128,540	1	2,179
Logged (less than 20 yrs. ago)	9	60	0.613	94	153,505	4	6,525
Totals and Averages	81	710	7.244	3,605	483,849	120	16,5[illegible]

B. STUDY OF THE EFFECTS OF CUTTING METHODS ON RIBES SEED GERMINATION AND SEEDLING SURVIVAL.

Purpose:

Since it seemed inadvisable, under the present conditions, to attempt to continue an intensive study of the several factors which might be operative in inhibiting or stimulating the germination and growth of Ribes plants under the several conditions found when various disturbing factors were made operative such as clear-cutting, selective logging, fire, road building, etc., it was decided to make a general field survey of those areas included in the operations of the Clearwater Unit of the Potlatch Forests, Inc. As was explained on page 82 of the 1931 Annual Report, these areas have been logged on a selective basis by this company with the idea of supporting a sustained yield through a 36-year cutting cycle.

This plan was inaugurated by the company in 1928 in their second growth white pine stands so that there are now represented in the areas cuttings for the years 1928, 1929, 1930 and 1931. As the plan was originally worked out by the consulting foresters, the region was divided into the following types:

1. Pure white pine having 70-100 per cent white pine. On such types 60 per cent of the white pine was to be removed, taking nothing under a

TABLE [illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Area Per cent Age Class	Age class of Timber Stands
[illegible]	81	[illegible]	[illegible]	[illegible]	170	13	10-20 yrs.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15	21-40 yrs.
		[illegible]	[illegible]	[illegible]	[illegible]	7	41-60 yrs.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10	61-100 yrs.
		[illegible]	[illegible]	[illegible]	[illegible]	6	101-150 yrs.
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	11	150-200 yrs.
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	4	200+ yrs.
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Logged (less than 10 yrs. ago)
[illegible]		[illegible]	[illegible]	710	[illegible]	[illegible]	Totals and Averages

B. [illegible]

[illegible]

Since it seemed inadvisable, under the present conditions, to attempt to continue an intensive study of the several factors which might be operative in inhibiting or stimulating the germination and growth of [illegible] plants under the several conditions [illegible] fire, road building, etc., it was decided to make a general [illegible] of those areas included in the operations of the [illegible] unit of the Potlatch Forests, Inc. As was explained on page [illegible] of the [illegible] Report, these areas have been logged on a selective basis [illegible] with the idea of supporting a sustained yield through a [illegible] cutting cycle.

This plan was inaugurated by the company in [illegible] growth white pine stands so that there are now represented in the areas cuttings for the years [illegible] [illegible] into the following types:

1. [illegible] 60 per cent of the white pine was to be removed, [illegible]

17-inch D.B.H. limit.

2. White pine mixed type, 40-69 per cent white pine and 60 per cent of the volume to be removed, leaving everything under 14 inches D.B.H.

3. Mixed white pine type, 10-39 per cent white pine, 40 per cent to be removed and leaving everything under 13 inches D.B.H.

4. Mixed, 0-10 per cent white pine. Not being cut.

It was originally planned at the beginning of the field season to make the surveys strictly according to the above-outlined types. By such a method, it was thought that perhaps somewhere would be struck a point in the logging processes whereby the surveys would show a definite correlation between the volume of timber left on such areas and the numbers of Ribes coming in.

After arriving on the ground, however, it was found that these various types were so indistinct and poorly defined that no attempt was made to differentiate between them. Instead, the areas were worked indiscriminately, care being taken, however, to locate each area that was worked accurately on the company map so that later an effort can be made to obtain a complete history of the stand, together with the company's data on the volume removed and the type assigned by them to each.

The results included below are only assumed to be tentative and will serve merely as an index as to what is actually taking place as far as the Ribes population is concerned following such types of cutting. In addition to the Ribes counts, records were kept of all conifer reproduction following logging and brush burning. On all of the operations the brush was piled and burned. However, since on several areas brush burning had been deferred for varying periods of time, it has been difficult to designate the various areas according to cutting years only, since the burning of the brush constitutes as important a part of the process as the actual felling of the trees. There can be no doubt, however, as to the significance of the data obtained, although it is readily agreed that results from such a survey as this must necessarily be only indicative in their nature.

Methods:

The method employed in making the Ribes and conifer counts was as follows: on each area to be studied, compass lines were run across the area usually three chains apart. On these lines, also at three-chain intervals were laid down milacre sample plots 13.2 feet by 3.3 feet. This type of milacre was selected because of the greater ease of counting seedlings than could be obtained with a square milacre. On these milacres

17-inch D.B.H. limit.

2. White pine mixed type, 40-50 per cent cut [illegible] of the volume to be removed, leaving everything [illegible]

3. Mixed white pine type, 1-25 per cent cuts [illegible] be removed and leaving everything under 11 inches.

4. [illegible]

It was originally planned at the outset of the [illegible] to make the surveys strictly according to the above-outlined types. With such a method, it was thought that guidance enough to [illegible] point in the logging processes whereby the surveys would show [illegible] correlation between the volume of timber left on each area and the [illegible]

After arriving on the ground, however, it was found that these various types were so indistinct and poorly defined that no attempt was made to differentiate between them. Instead, the areas [illegible] was marked accurately on the company map so that later [illegible] be made to obtain a complete history of the stand, [illegible] company's data on the volume removed and the type [illegible] each.

The results included below are only [illegible] will serve merely as an index as to what is [illegible] as the Ribes population is concerned following [illegible] In addition to the Ribes counts, records were [illegible] reproduction following logging and brush burning, [illegible] tions the brush was piled and burned. However, [illegible] brush burning had been deferred for varying periods [illegible] difficult to determine the surface areas according to [illegible] since the burning of the brush constitutes as important [illegible] process as the actual felling of the trees. [illegible] however, as to the significance of the data obtained [illegible] readily agreed [illegible] only indicative in their nature.

Methods

The method employed to obtain the Ribes and seedling counts was as follows: on each area to be studied, compass lines were run [illegible] intervals were laid out [illegible] This type of milacre was selected because of the greater size of sample seedlings than could be obtained [illegible]

were counted all Ribes seedlings by species and year of germination. In addition to the Ribes counts, separate counts were kept of white pine seedlings and other coniferous reproduction. It was not attempted in many cases to cover the entire area of each logging operation, but a large enough portion was sampled to be representative. During the season approximately 1,000 acres were covered by this method, representing samples of all of the selective cuttings which have been made by this company in the second growth stands for the years 19[illegible]-1930 inclusive. In addition, about 200 acres were covered on clear cutting, besides nearly 150 milacres on railroad grades.

Data were kept on special field form #t7 as appended and each area has been designated by number.

Results:

The following table shows the distribution of the areas sampled, together with the number of acres counted in each case and the total number of acres studied:

were counted all Ribes seedlings by species and year of germination. In addition to the Ribes counts, separate counts were kept of small white pine seedlings and other coniferous reproduction. It was not attempted in many cases to cover the entire area of each logging operation, but a large enough portion was [illegible] to be [illegible]. Approximately 1,000 acres were covered by this method, representative samples of all of the selective cuttings which have been made by the company in the second growth stands [illegible] years [illegible] inclusive. In addition, about 300 acres were covered on clear cutting, besides nearly 150 milacres on railroad grades.

Data were kept on special field form 167 as appended and each area has been designated by number.

Results:

The following table shows the distribution of the areas examined together with the number of acres counted in each case and the total number of [illegible] counted:

WF-BRC-#67 6/21/32 ECOLOGY

Data taken by ______________ Date ______________ Name of area ______________
Location of Area S.______________ T.______________ R.______________
Size of Area ______________ Date of disturbance ______________

Type of Disturbance ______________ Age of Original Stand ______________
REMARKS: ____

Line No.	Mil-acre No.	Exposure	Year	Number of Ribes				Number of Conifers		Special Plot Conditions
				R. vis.	R. lac.	R. pet.	R. iner.	W.P.	Others	
			1932							
			1931							
			1930							
			1929							
			PBL							
			1932							
			1931							
			1930							
			1929							
			PBL							
			1932							
			1931							
			1930							
			1929							
			PBL							
			1932							
			1931							
			1930							
			1929							
			PBL							
			1932							
			1931							
			1930							
			1929							
			PBL							

TABLE NO. 1

DISTRIBUTION AND TOTAL AREA OF SAMPLE PLOTS

Railroad Grades		Clear Cutting 192[illegible]		Selective Cutting 1930		Selective Cutting 1929		Selective Cutting 1928	
Area No.	No. Mil-acres	Area No.	No. Acres	Area No.	No. Acres	Area No.	No. Acres	Area No.	No. Acres
3	25	9	20	13	91.2	25	63	6	[illegible]
10	8	34	86	19	43.0		14	7	31.6
11	22	32,32[1]	90	27	44.0	33	46	8	45.0
23	23			25	63.0	20	35	16	72.0
30	17			37	24.0	12	62.8	17	44.0
35	37			38	44.0				
Totals	132		196		308.2		210.8		221.2

From the above table it can be seen that the acreage covered was not apportioned equally among the cuttings for the various years. This was due mainly to the fact that the Ribes eradication crews began their work in the 1929 selective cuttings and had worked many of the areas before a survey could be accomplished. The 1928 cuttings are limited in number, so that it was impossible to obtain a larger acreage representative of that year.

The clear-cut areas represented above were partly on the Clearwater Timber Company's tract and partly on an area known as the Cardiff operation. This latter area afforded an excellent demonstration of the undesirable effects following destructive logging. On parts of the area practically every tree that had not been taken out for lumber was later killed by burning. Other parts of the area where the fire had not been so intense, still supported living trees. It is interesting to note, however, that where the fire had been less intense, there were many more Ribes per acre. On areas such as pictured in photograph 1127 on the following page where no living trees remained, few if any Ribes were found, while on areas such as pictured by photograph 1130 where living trees remained, Ribes were found as numerous as 5,000 per acre.

The railroad grades are not listed in terms of acres, due to the fact that the surveys were made in very small areas and were so broken up by bridges and fills that only the actual number of milacres are given and no attempt made to give actual acres covered.

TABLE [illegible]

DISTRIBUTION AND TOTAL AREA OF SAMPLE PLOTS

Area No.	Railroad Grades Ten Mil Stns.	Clear Cutting 1931 Area Ac.	Clear Cutting 1931 No. Plots	Selective Cutting 1930 Area Ac.	Selective Cutting 1930 No. Plots	Selective Cutting 1929 Area Ac.	Selective Cutting 1929 No. Plots	Selective Cutting 1928 Area Ac.	Selective Cutting 1928 No. Plots
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
36	[illegible]			[illegible]	[illegible]				
Totals	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]	

From the above table it can be seen that the [illegible] were not apportioned equally among the cuttings for the various years. This was due mainly to the fact that the Ribes eradication crews had done much work in the 1928 selective cuttings and had removed many of the ribes before a survey could be accomplished. The 1929 cuttings are limited in extent, so that it was impossible to obtain a larger acreage from that year.

The clear-cut areas represented above were partly on the Clearwater Timber Company's land and partly on an area along the [illegible] Cardiff operation. This latter area afforded an excellent demonstration of the undesirable effects following destructive logging, as practically every tree that had not been taken out for logs had been later killed by burning. Other parts of the area where the fire had not been so intense, still supported living trees. It is interesting to note, however, that where the fire had been less intense, there were [illegible] more Ribes per acre. On areas such as pictured in photograph [illegible] on the following page where no living trees remained, [illegible] Ribes per acre were found, while on areas such as pictured by photograph III [illegible] trees remained, Ribes were found as numerous as 6,000 per acre.

The railroad grades are not listed in terms of acres, due to the fact that the survey [illegible] broken up by bridges and fills that only the actual number of stations are given and no attempt made to give actual acres covered.

W. 1127. Clear-cut area followed by heavy burn. On this area practically all trees remaining after logging have been killed by burn. Very few Ribes coming in.

W. 1130. Clear-cut area followed by burn of less intensity than pictured above. On areas such as this where living trees remain, Ribes are coming in at a great rate, as high as 5,000 per acre.

TABLE NO. 2

RIBES VISCOSISSIMUM PER ACRE

Railroad Grades		Clear Cutting 1928		Selective Cutting 1930		Selective Cutting 1929		Selective Cutting 1929	
Mil-acres	R. vis. Per Acre	Acres	R. vis. Per Acre	Acres	R. vis. Per Acre	Acres	R. vis. Per Acre	Acres	R. vis. Per Acre
25	29,000	20	900	91.2	2,141	53	820	36.6	[illegible]
8	7,000	86	1,218	43.0	716	14	560	21.6	88.[illegible]
22	11,000	90	4,705	44.0	317	46	45	44.0	106.[illegible]
23	7,626			62.0	1,317	35	21	75.0	
17	1,647			24.0	26	62.8	812	44.0	
37	4,810			44.0	362				
132	65,263	196	6,823	308.2	4,379	210.8	2,253	221.2	282.[illegible]
Averages Per Acre	10,880.5		2,274.3		813.2		451.6		56.5

TABLE NO. 3

RIBES LACUSTRE PER ACRE

Railroad Grades		Clear Cutting 1928		Selective Cutting 1930		Selective Cutting 1929		Selective Cutting 1929	
Mil-acres	Av. No. Per Acre	Acres	Av. No. Per Acre	Acres	Av. No. Per Acre	Acres	Av. No. Per Acre	Acres	Av. No. Per Acre
25	160	20	650	91.2	9.0	53.0	1,193.0	36.6	220.0
3	-	36	1,556	43.0	16.0	14.0	160.0	21.6	676.[illegible]
22	-	90	-	44.0	466.0	46.0	-	46.0	-
23	2,130			62.0	230.0	35.0	42.0	75.0	-
17	-			24.0	[illegible]	62.8	36.0	44.0	16.6
37	622			44.0	17.0				
132	2,912	196	2,206	308.2	816.0	210.8	1,421.0	221.2	912.9
Av. Per Acre	486		735.3		136.0		284.2		182.6

TABLE NO. 4.

WHITE PINE PER ACRE

Railroad Grades		Clear Cutting 1928		Selective Cutting 1930		Selective Cutting 1929		Selective Cutting [illegible]	
Mil-Acres	White Pine Per Acre	Acres	White Pine Per Acre	Acres	White Pine Per Acre	Acres	White Pine Per Acre	Acres	White Pine Per Acre
25	350.0	20	250.0	91.2	347.0	53.0	970.0	35.6	700.[illegible]
8	250.0	36	176.0	43.0	146.0	14.0	1,060.[illegible]	21.6	411.0
22	337.0	90	136.0	44.0	161.0	46.0	547.0	45.0	514.7
23	4,304.0			62.0	117.0	38.0	[illegible]	75.0	1,[illegible]
17	1,117.0			24.0	[illegible]4.0	62.8	281.0	44.0	2,026.2
37	3,734.0			44.0	293.0				
152	10,043.0	196	562.0	308.2	1,733.0	210.8	[illegible]	221.2	[illegible]
Av. Per Acre	1,673.6		137.1		241.3		775.4		1,056.0

TABLE NO. 5

CONIFERS OTHER THAN WHITE PINE PER ACRE

Railroad Grades		Clear Cutting 1928		Selective Cutting 1930		Selective Cutting 1929		Selective Cutting [illegible]	
Mil-Acres	Other Conifers Per Acre	Acres	Other Conifers Per Acre	Acres	Other Conifers Per Acre	Acres	Other Conifers Per Acre	Acres	Other Conifers Per Acre
25	-	20	1,200	91.2	906	53	[illegible]	35.6	3,806.0
8	-	86	218	43.0	315	14	2,520.0	21.6	1,550.7
22	2,777	90	1,639	44.0	1,363	46	452.0	45.0	1,052.9
23	-			62.0	1,082	38	650.0	75.0	993.4
17	-			24.0	906	62.8	762.0	44.0	4,747.0
37	-			44.0	374				
152	2,777	196	3,207	308.2	4,976	210.8	[illegible]	221.2	10,442.1
Av. Per Acre	442		1,069		829.3		1,677.8		2,085.4

Tables Nos. 2, 3, 4 and 5 show the general results of the studies with the average number per acre of R. viscosissimum, R. lacustre, white pine, and other conifers on the areas surveyed. R. petiolare was found in varying numbers on the several areas studied but since they were limited mainly to the stream areas no appreciable effects on their numbers could be detected by the various types of cuttings.

Graph I gives a picture of what is occurring in these areas under the different methods of treatment. Considering the upland species of Ribes, R. viscosissimum, it can be seen that immediately following the logging operations, that is, in the 1930 cuttings, an average of 970.6 Ribes per acre was found. Two years later, as indicated by the average for the 1928 cuttings, the number has dropped to 56.5 per acre. This, when the area is logged according to the selective method.

Comparing the average for the 1926 selective cuttings with the average for the clear-cut and broadcast burned areas which were cut in 1926, there is a total of 2,274.2 in the latter and 56.6 in the former. While the number of acres represented in the two are not quite the same, the average numbers of Ribes are so widely divergent that they are bound to be significant.

Thus it appears that each year after the second, following logging according to the selective method, the numbers of R. viscosissimum diminish rapidly. This is not true when the area is clear cut. Comparing the results in a similar manner for R. lacustre, we find no such striking evidence. While the number of R. lacustre in the clear-cut areas was greater than in any of the selectively logged areas, this was due partly to large concentrations of this species along the streams and is in a very slight degree, if any, due to the type of logging process or length of time following such. For example, the general average for the 1926 cuttings was practically the same as for the 1930 areas.

Making a comparison between the numbers of R. viscosissimum found along the railroad grades with those found in any of the types of cuttings brings out in a striking manner the effect of complete removal of the forest canopy coupled with ground disturbance. When R. lacustre is compared in the same manner no such evidence is produced.

Although granted that the selective method of logging as practiced by the Clearwater Timber Company appears to offer a possible means of control for the upland Ribes, such as R. viscosissimum, it could not be recommended very strongly from a silvicultural point of view if it proved detrimental to the inception of coniferous reproduction, especially white pine.

Referring to Table No. 4 and again to Graph I, it is seen that the average number of white pine seedlings occurring in the 1930 cuttings

Tables Nos. 2, 3, 4 and 5 show the summarized results of these studies with the average number per acre of [illegible], [illegible] white pine, and white seedlings on the [illegible] [illegible] found in varying numbers on the [illegible] [illegible] limited mainly to the stream areas no appreciable effects on their numbers could be detected by the various types of cuttings.

Graph I gives a picture of what is occurring to these areas under the different methods of treatment. Considering the [illegible] of Ribes, E. viscosissimum, it can be seen that immediately following the logging operations, that is, in the 1930 cuttings, an average of 970.6 Ribes per acre was found. Two years later, as indicated by the average for the 19[illegible] cuttings, the number has dropped to [illegible] per acre. This, when the area is logged according to the selective method.

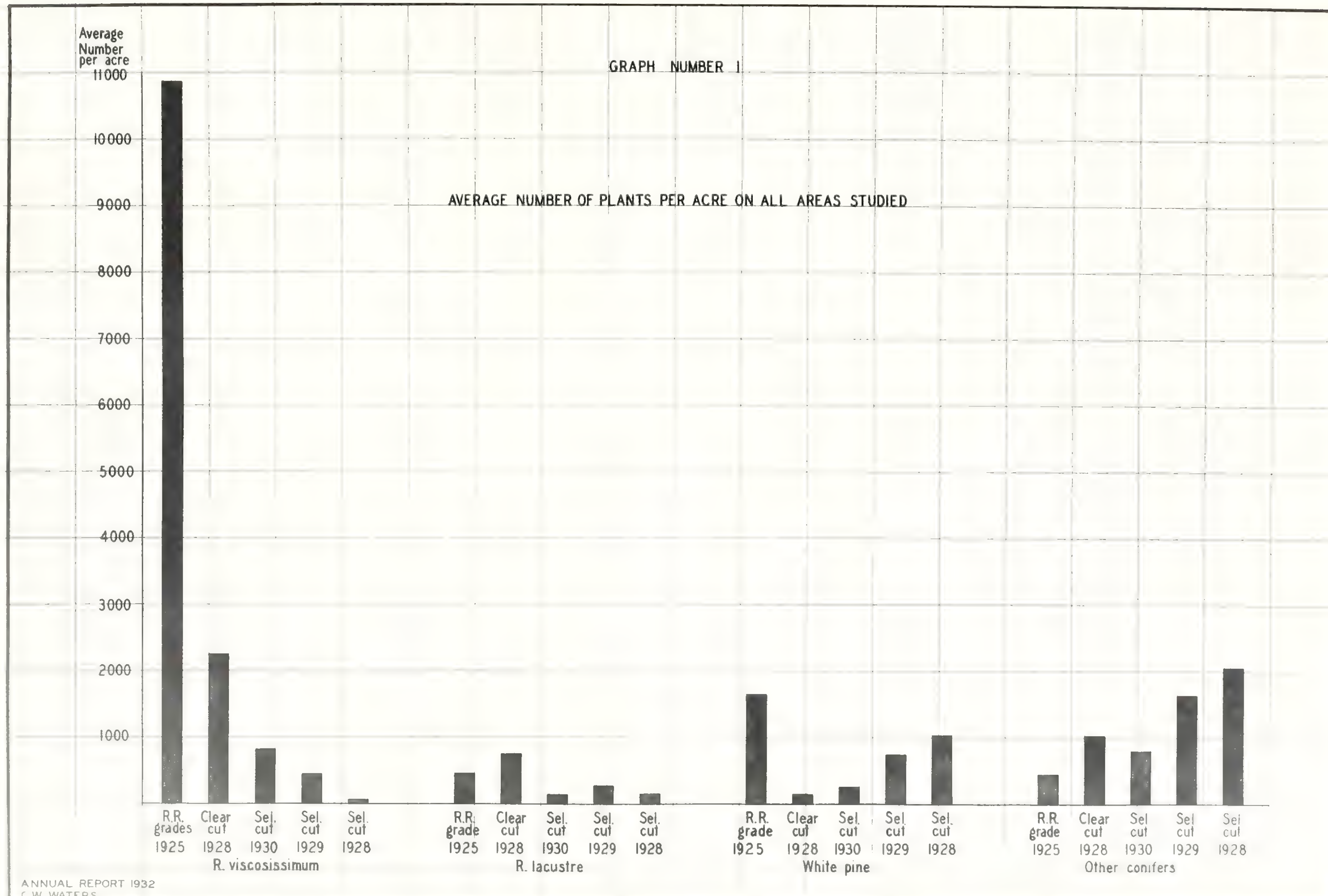
Comparing the average for the 1930 selective cuttings with the average for the clear-cut and broadcast burned areas which were cut in 1929, there is a total of 2,276.3 in the latter and [illegible] in the former. While the number of acres represented in the [illegible] [illegible] the average numbers of Ribes [illegible] [illegible] to be significant.

Thus it appears that one year after the cutting, following logging according to the selective method, the number of [illegible] diminish rapidly. This is not true with the area as [illegible] the results in a similar manner for [illegible] evidence. While the number of [illegible] was greater [illegible] to large concentrations of this species along the streams and is in a very slight degree, if any, due to the type of logging process or length of time following [illegible]. For example, the general average for the [illegible] cuttings was practically the same as for the 1930 areas.

Again, a comparison between the numbers of [illegible] found along the skidding grades with those found in any of the types of cuttings brings out in a striking manner the effect of complete removal of the forest canopy [illegible] compared in the same manner no such evidence is produced.

Although granted that the selective method of logging [illegible] means of control for the volume effect, such as [illegible], it could not be recommended very strongly from a silvicultural point of view if it proved detrimental to the invasion of a different succession, [illegible] white pine.

Referring to Table No. 4 and again to Graph I, it is seen that the average number of white pine seedlings occurring in the 1930 cutting


GRAPH NUMBER 1
AVERAGE NUMBER OF PLANTS PER ACRE ON ALL AREAS STUDIED
Average Number per acre
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
R.R. grades 1925
Clear cut 1928
Sel. cut 1930
Sel. cut 1929
Sel. cut 1928
R. viscosissimum
R.R. grade 1925
Clear cut 1928
Sel. cut 1930
Sel. cut 1929
Sel. cut 1928
R. lacustre
R.R. grade 1925
Clear cut 1928
Sel. cut 1930
Sel. cut 1929
Sel. cut 1928
White pine
R.R. grade 1925
Clear cut 1928
Sel. cut 1930
Sel. cut 1929
Sel. cut 1928
Other conifers
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C.W. WATERS

was 241.3. This includes only those white pine which were less than three years of age and which for the most part have come in following logging. Comparing this with the cuttings for 1929, we find the number has increased to 775.4 per acre in the latter. Referring to the average for the 1930 cuttings, we find that the number has increased to 1,0[illegible].0 seedlings per acre. Assuming that on the average the 1928 cuttings represent the same general conditions as for the cuttings made in 1929 and 1930, it is evident that the conditions offered by selective logging were anything but inhibitory to the germination and survival of white pine reproduction. It appears then, that the above method of logging not only insures a sufficient number of white pine seed trees remaining to restock the area, but that the conditions produced by such cutting methods are satisfactory for the germination of such seeds. As to the ultimate survival of such resulting seedlings beyond the fourth year, time alone can tell. Aside from the immediate point, it is interesting to note the large numbers of white pine which were coming in on the railroad grades. For example, the general average was 1,675.6 per acre for the total area surveyed.

As might be anticipated, the other coniferous reproduction including western red cedar, western larch, and white fir followed about the same trend as the white pine.

In Graph 3 is shown the general trend of R. viscosissimum, R. lacustre, white pine reproduction and other conifer seedlings under the various conditions found during the past season and also a comparison between their numbers in any one type of cutting. The average numbers of each species on railroad grades are not shown in this chart.

Summary:

From the results as brought out in this preliminary report of a survey of conditions in the Clearwater region of Idaho, it appears that:

1. Clear cutting followed by broadcast burning produces conditions favorable for the inception and continued survival of large numbers of R. viscosissimum and presents a serious blister rust hazard. Other types of disturbances produced by the construction of railroad grades and embankments are equally as dangerous.

2. Certain types of selective cuttings such as practiced by the Clearwater Timber Company are followed by moderate numbers of R. viscosissimum the first or second year following logging, but each succeeding year shows a rapid decline in their numbers. It thus appears that conditions produced by such type of logging is inhibitory to the long survival of such seedlings.

3. Selective logging does not have a marked effect on either R. lacustre or R. petiolare since these species tend to be somewhat limited to the stream areas, the conditions of which are changed very little by

was 251.5. This includes only those which [illegible] three years of age and under for the more part have [illegible] in [illegible] logging. Comparing this with the cuttings for 1919, [illegible] the number has increased to 778.8 per acre in the latter. [illegible] for the 1920 cuttings, we find that the number has increased to [illegible] seedlings per acre. Assuming that [illegible] average [illegible] cuttings represent the same general conditions [illegible] cuttings made in [illegible] and 1920, it is evident that the conditions created by such logging were anything but favorable to the [illegible] survival of white pine reproduction. It appears then, that the [illegible] method of logging not only insures a sufficient number of white pine seed trees [illegible] to restock the area, but that the conditions produced by such logging are satisfactory for the germination of such seeds. [illegible] survival of such resulting seedlings beyond the fourth year, [illegible] can tell. Aside from the immediate point, it is interesting to note the large numbers of white pine which were coming in [illegible]. For example, the general average was 1,[illegible] per acre for the [illegible] surveyed.

As might be anticipated, the [illegible] including western red cedar, western larch, [illegible] the same trend as the white pine.

In graph 9 is shown [illegible] larch, white pine reproduction [illegible] various conditions found under the seed trees [illegible] their numbers in any one [illegible] species on railroad [illegible] not shown in this chart.

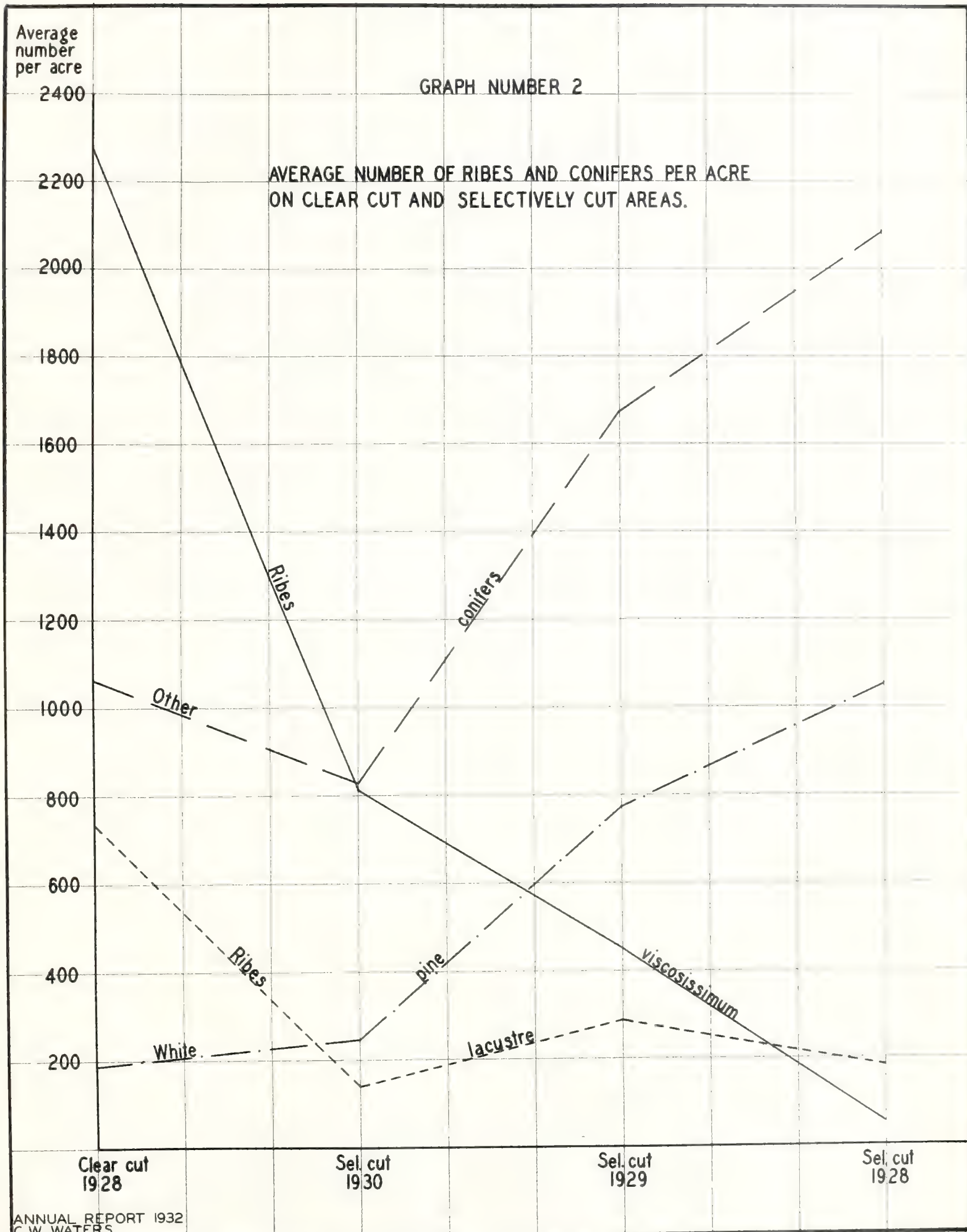
———

From the results as brought out [illegible] a survey of conditions in the [illegible]:

1. Clear cutting followed by broadcast burning [illegible] favorable for the inception and continuous survival of [illegible] P. monticola [illegible] and produces a [illegible] of disturbances produced by the [illegible] encroachments are [illegible].

2. Certain types of selective cutting [illegible] Clearwater Timber Company are followed [illegible] the first or second year following logging, but each [illegible] shows a rapid decline in their numbers. [illegible] produced by such type of logging is [illegible] seedlings.

3. Selective logging does not have a marked effect on [illegible] laricina or L. [illegible] since these species [illegible] to the stream areas, the conditions of which are [illegible]



Average number per acre
GRAPH NUMBER 2
AVERAGE NUMBER OF RIBES AND CONIFERS PER ACRE ON CLEAR CUT AND SELECTIVELY CUT AREAS.
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
Ribes
viscosissimum
conifers
Other
pine
White
Ribes
lacustre
Clear cut 1928
Sel. cut 1930
Sel. cut 1929
Sel. cut 1928
ANNUAL REPORT 1932
C.W. WATERS.

logging operations of any nature.

4. Selective logging of the type treated in this report appears to insure the restocking of white pine and other coniferous reproduction; such reproduction appears to be thriving and increasing at the end of the fourth year following logging.

5. Considerable saving might be accomplished in the Ribes eradication program if such areas as are selectively logged can be safely left until the third or fourth year following logging. If it could be determined that no serious blister rust hazard exists during this interim of three or four years, the number of Ribes might be reduced from 1/5th to 1/10th their original number. It is likely that future studies will show a further decrease in the number of Ribes each succeeding year.

C. EFFECTS OF CLOSING IN OF FOREST CANOPY ON UPLAND RIBES.

For some time it has appeared from field observation that there comes a time in the history of a stand of timber when species of upland Ribes contained therein such as R. viscosissimum, and to a lesser degree perhaps R. lacustre are crowded out, due to the closing in of the canopy of the tree crowns. Scattered observations have been made from time to time by the workers in the field and all have appeared to point to this same conclusion. During the past season the attention of the writer was called by Mr. B. A. Anderson, in charge of the eradication camps on the Clearwater at Headquarters, Idaho, to an area on the Alder Creek drainage which seemed to bear this out. After a preliminary examination, at Mr. B. A. Anderson's suggestion, it was decided to establish a small plot in such an area and attempt to make a careful study of the situation.

This area lies on a northwest exposure of Alder Creek drainage and is located in the southwest quarter of the southeast quarter of section 9, township 38 north, range 5 east. At the time that attention was called to the area, eradication had progressed to a stage where only a small acreage was left and for this reason the site selected for study was not necessarily the best for the purpose.

This area in question was apparently burned over about thirty years ago. It now supports a dense stand of thirty-year old white pine reproduction. (1109) Scattered in this reproduction are bushes of R. viscosissimum and R. lacustre which appear to be in the last stages of suppression, the latter apparently in better state of vigor than the former.

In the area where no Ribes eradication had been performed, a plot was laid out .7 of an acre in extent. The plot faces northwest with approximately a 22 degree slope. It was marked with permanent corner posts and a trail blazed around the border so that no difficulty will be experienced in tracing its limits in future years. Within the plot each

logging operations of any nature.

4. Selective logging of the type treated in this report should insure the reseeding of white pine and other coniferous reproduction; such reproduction appears to be thriving and increasing at the end of the fourth year following logging.

5. Considerable saving might be accomplished in the [illegible] eradication program if such areas as are selectively logged can be [illegible] until the third or fourth year following logging. If it is determined that no serious blister rust hazard exists during the interim of three or four years, the number of [illegible] from 1/5th to 1/10th their original number. It is likely that [illegible] studies will show a further decrease in the number of [illegible] each succeeding year.

[illegible]

For some time it has been [illegible] that there comes a time in the history of a stand of [illegible] Ribes containing dwarfs such as R. viscosissimum, [illegible] perhaps R. lacustre are crowded out, due to the [illegible] of the tree crowns. Scattered observations have been made from time to time by the workers in the field and all have pointed to [illegible] same conclusion. [illegible] called by Mr. R. R. Anderson, in charge of the [illegible] Clearwater at headquarters, Idaho, to an area on the [illegible] which seemed to bear this out. After a preliminary examination, on Mr. R. A. Anderson's suggestion, it was decided to [illegible] such an area and attempt to make a careful study of the situation.

This area lies on a [illegible] and is located in the southwest [illegible] section 2, township [illegible] was called to the area, [illegible] a small acreage was left and [illegible] was not necessarily the best for [illegible]

This area in question was [illegible] years ago. It now supports a dense stand [illegible] reproduction. (Plot) Scattered in this [illegible] R. viscosissimum and R. lacustre which appear [illegible] suppression, the latter apparently in better [illegible]

In the area where no Ribes eradication had [illegible] plot was laid out [illegible] of an acre in extent. The plot [illegible] approximately [illegible] slope. It was marked with [illegible] posts and a small [illegible] around the border so that no difficulty [illegible] experienced in locating the limits in future years. [illegible]

Ribes bush was marked with a cedar stake on which was tacked a metal tag with the serial number of the bush and species designation.

Each bush was examined carefully and the following data taken: bush number, species, feet of live stem, feet of dead stem, condition of bush, square inches of leaf surface, number of leaves, living branches coming from crown, dead branches coming from crown, and height of bush.

One hundred thirty-one bushes of R. lacustre and 63 of R. viscosissimum were tagged and described. This is at the rate of 277 Ribes per acre.

In addition to the living bushes which were tagged and described, numerous dead bushes were encountered which were undoubtedly Ribes bushes that had already succumbed. Such, however, is only a supposition since the dead stems could not be identified definitely as Ribes. It is planned to examine the plot each year and check each Ribes plant as to the points mentioned above. From the results of this study it is hoped that we may be able to obtain some definite information relative to the events which occur at what appears to be a very critical stage in the life history of the upland Ribes species.

During the examination of the plot this summer, several sections of stems were cut from what appeared to be the oldest bushes of both R. viscosissimum and R. lacustre. These sections were brought to the University of Montana for microscopical study. The results of such examinations showed the plants to be approximately ten years of age and not 25 or 30 as was first estimated, based on previous observations of like nature. Does this mean then, that the seeds which propagated these bushes were brought into the stand from outside sources 10 or 12 years ago, or do these present bushes represent the second or third generation of Ribes, the first of which originated from stored seed following the fire of 30 years ago?

In either case, it is evident that the present generation of Ribes are in a decadent condition and from the general appearance of the bushes it is difficult to see how they can survive many more seasons. If such predictions should be borne out by actual figures, it will raise the question of the inadvisability of the working of such similar areas by the Ribes eradication forces. A glance at picture 1112 of R. viscosissimum and picture 1111 of R. viscosissimum and R. lacustre, all taken from the study plot, will show that the amount of leaf area supported by these plants would not present a very serious blister rust hazard providing it could be shown that such hazard would progressively diminish each year. Many areas similar to this one must exist over the white pine areas of northern Idaho and if it could be proved beyond reasonable doubt that nature could be depended upon to perform Ribes eradication on such areas by natural means, a considerable saving could be made over man-power methods.

[illegible] was [illegible] with [illegible] of the [illegible]

[illegible] bunch number, [illegible], [illegible] feet of [illegible], [illegible] inches of leaf surface, number of leaves, [illegible] from [illegible], dead [illegible] [illegible]

One hundred thirty-one [illegible] of [illegible] were [illegible] and [illegible]. [illegible]

In addition to the living [illegible] numerous dead [illegible] were encountered which [illegible] that had already succumbed. [illegible], however, the [illegible] the dead stems could not be [illegible] planned to [illegible] potato [illegible]. [illegible] the results of this study [illegible] may be able to obtain some definite knowledge [illegible] occur at what appears [illegible] critical [illegible]

[illegible] of stems were [illegible] B. [illegible] [illegible] 20 or 30 as the first [illegible] [illegible] This [illegible] to three percent [illegible] the first of which [illegible] [illegible]

In other [illegible] it is [illegible] [illegible] it is difficult to [illegible] such [illegible] should be [illegible]

[illegible] of B. [illegible] [illegible] will [illegible] would not [illegible] [illegible] similar [illegible] and if [illegible] [illegible] upon [illegible] a considerable [illegible]

W. 1105. View showing a stand of white pine reproduction following a 30 year old burn. Study plot located in this area.

W. 1111. Bushes of R. viscosissimum (left) and R. lacustre (right) on study plot. Note density of vegetation on plot.

W. 1112. Bush of R. viscosissimum from study plot. Note presence of only three leaves and many feet of dead stem.

It is hoped that study plots may be established in other areas of comparable nature scattered over the white pine region so that results obtained may be more conclusive.

RIBES ERADICATION, INLAND EMPIRE

By

C. C. Strong,
Associate Forester

Cooperative Ribes eradication on private lands in 1932 suffered approximately a [illegible] per cent decrease over 1931 while similar work on national forests was increased by approximately 40 per cent. The net result, however, was an aggregate increase in volume of work of about 15 per cent for Ribes eradication in north Idaho.

The following table shows the expenditures by agencies for the various Ribes eradication projects in 1932:

TABLE NO. 1

RECORD OF EXPENDITURES BY PROJECTS, 1932

Project	Expenditures by Agencies			
	Division of Blister Rust Control	U.S. Forest Service	State and Private	Total
Clearwater Nat. Forest	$19,[illegible].78	$1[illegible]1,714.00	-	$14[illegible],704.78
St. Joe National For.	9,622.67	90,153.12	-	99,775.79
Clearwater T.P.A.	19,1[illegible].19	-	$10,064.3[illegible]	29,[illegible].54
Priest Lake T.P.A.	14,322.76	-	8,003.42	22,326.19
Upper St. Maries River	2,81[illegible]	-	1,200.00	[illegible]
All	$65,47[illegible]	$211,[illegible]7.12	$19,267.78	$[illegible]

On some of the operations previous to 1932, depending upon the factors affecting development of the rust in the separate localities, Ribes have been destroyed in degrees varying from working stream type only to 100 per cent coverage of all areas, upland and stream. Due to the discovery that blister rust was making rapid inroads it was felt that the time was ripe for making a complete clean-up of Ribes on future operations and that, as rapidly as possible, upland areas in localities where stream type Ribes had been previously destroyed should be worked. Hence the policy in 1932 was to do 100 per cent Ribes eradication on both stream and upland and to rework any stream type within the boundaries of 1932 units which had been worked previously.

The spray used for treating R. petiolare in 1932 was made by dissolving 9 pounds of sodium chlorate in 10 gallons of water. To this solution was added the usual glue sticker and spreader.

Cooperative Ribes eradication on private lands was, as in previous years, under the full direction of the Division of Blister Rust Control. On national forests, however, the work was handled according to the terms of

[illegible]

By

[illegible]

[illegible]

Cooperative Ribes eradication on private lands in 1932 [illegible] approximately a 23 per cent decrease over 1931 while similar work on national forests was increased by approximately 46 per cent. The net result, however, was an aggregate increase in volume of work of about 12 per cent for Ribes eradication in north Idaho.

The following table shows the expenditures by [illegible] for various Ribes eradication projects in 1932:

Table No. 1

[illegible]

Project	Division of Blister Rust Control	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
All	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

On some of the operations previous to 1932, depending upon the factors affecting development of the rust in the separate localities, [illegible] have been destroyed in degree, varying from [illegible] up to 100 per cent coverage of all areas, upland and stream. Due to the discovery that blister rust was making rapid inroads it was felt that the time was ripe for making a complete clearance of Ribes on [illegible] and that, as rapidly as possible, upland areas in localities where stream-type Ribes had been previously destroyed should be worked. [illegible] in 1932 was to do 100 per cent Ribes eradication on [illegible] areas and [illegible] and to rework any stream type within the boundaries of [illegible] had been worked previously.

The spray used for treating R. petiolare in 1932 was made by dissolving 9 pounds of sodium chlorate in 10 gallons of water. [illegible] solution was added the usual glue sticker and spreader.

Cooperative Ribes eradication on private lands was, [illegible] years, under the full direction of the Division of Blister Rust Control. [illegible] national forests, however, the work was handled according to [illegible]

the agreement of February 2, 193[illegible] which states:

"The Forest, through its project chief, will supply the labor, purchase all supplies, place the camps, handle all of the service of supply.

"The Blister Rust Control, through its overhead, will be responsible for the actual work of Ribes eradication on the ground, including methods of eradication, crew efficiency and limits of eradication necessary to protect the units selected.

"In the above lines the Forest Service project chief will not be responsible for execution, but will be responsible for inspection of the work and will discuss any proposals he may have for modification of methods or standards with the Blister Rust personnel. If there is a difference of opinion the matter will be considered through the Regional Office and the Blister Rust Control office. The general idea is that while the Blister Rust Control will direct the work, the Forest Service will want to maintain full information as to how the job is being handled, and the effectiveness of the use of its appropriation.

"The Forest Service project chief will be responsible for seeing the standards adopted by the Forest Service are in effect in such matters as hours of work, and the minimizing of noneffective time through careful planning.

"The relative order of attack, by localities and control projects, will be determined and agreed upon by conference between the two offices. After this decision the Blister Rust Control will undertake the preeradication survey, including mapping and classifying the white pine areas, determining the method of Ribes control and estimating the costs. After the surveys are completed the two offices will in conference agree on a plan of operation and determine the areas to be eradicated.

"The Blister Rust Control will continue its practice of advance scouting to determine the location and distribution of blister rust infestations on the national forests.

"The Blister Rust Control will take the responsibility for preparation of annual project and cost reports, using such Forest Service records as are necessary.

"Although the overhead, from camp bosses up, will be employed and paid by the Blister Rust Control, and the labor (including crew foremen) by the Forest Service, the selection of personnel is a matter of concern to both organizations. This will be handled by a conference of the Forest Service and Blister Rust Control representatives who will be in charge for each Bureau. The overhead personnel will be agreed on and the policy in selection of labor. As a matter of working convenience, the actual hiring

the agreement of December 2, 1938 which states:

"The Forest, through its project chief, will [illegible] purchase all supplies, place the camps, handle all of the [illegible] supply.

"The Blister Rust Control, through its personnel, will be responsible for the actual work of Ribes eradication on the ground, including methods of scouting, [illegible] to protect the units selected.

"In the above plans the Forest Service project chief will not be responsible for execution, but will be responsible for inspection of the work and will discuss any proposals he may have for modification of methods or standards with the Blister Rust Control. In event of difference of opinion the matter will be considered between the Regional Office and the Blister Rust Control office. The general idea is that while the Blister Rust Control will direct the work, the Forest Service will want to maintain full information as to how the job is being handled, and the effectiveness of the use of its appropriation.

"The Forest Service project chief will be responsible for seeing that the standards adopted by the Forest Service are in effect in such matters as hours of work, and the minimizing of nonproductive time through careful planning.

"The relative order of attack, by localities and control projects, will be determined and agreed upon by conference between the two offices. After this decision the Blister Rust Control will undertake the pre-eradication survey, including mapping and classifying the white pine types, determining the location of Ribes control and existing [illegible]. When the surveys are completed the two offices will in conference agree on a plan of operation and determine the areas to be eradicated.

"The Blister Rust Control will continue its practice of intensive scouting to determine the location and distribution of blister rust infections on the national forests.

"The Blister Rust Control will take the responsibility for [illegible].

"Although the personnel, from camp bosses up, will be employed and paid by the Blister Rust Control, and the labor (including camp foremen) by the Forest Service, the selection of personnel is a matter of concern to both organizations. This will be handled by a conference of the Forest Service and Blister Rust Control representatives who will act as liaison for each Bureau. The overhead personnel will be agreed on and [illegible] selection of labor. As a matter of working convenience, the [illegible]

of men will be handled in the Forest Supervisor's office, though with full participation and cooperation by the Blister Rust representatives."

SUMMARY OF RIBES ERADICATION DATA

The results of Ribes eradication are completely summarized in the various reports. However, a general summary of the results of work done on all the projects will undoubtedly be useful. The following table constitutes this summary:

TABLE NO. 2

SUMMARY OF RESULTS OF RIBES ERADICATION IN NORTH IDAHO - 1932

Eradication Type	Acres Worked	Man Days	Number Ribes Pulled	Gallons Spray Applied	Cost	Per Acre Basis: Man Days	Per Acre Basis: Ribes	Per Acre Basis: Cost
Open Reproduction	46,120	26,203.5	9,140,595		$144,749.75	.56	221	$3.21
Dense Reproduction	5,786	1,863.0	336,849		11,370.93	.37	67	1.97
Open Pole	1,421	743.0	441,497		4,557.66	.52	311	3.21
Dense Pole	999	56.0	12,206		338.02	.06	12	.34
Open Mature	43,003	7,791.0	2,037,380		47,760.16	.18	48	1.09
Dense Mature	2,009	242.0	43,897		1,370.16	.11	22	.68
Brush	3,026	2,238.5	630,769		12,096.45	.74	208	4.00
All Upland	102,262	38,127.0	12,693,523		$225,242.06	.37	124	2.17
Stream	8,633	9,304.9	1,938,601	63,578	$59,918.84	1.07	223	6.90
All Types	110,957	47,438.9	14,632,134	63,578	$285,161.90	.43	132	2.54
Second Working Stream Type*	3,733	2,068.0	490,530	8,995	$13,952.39	.55	131	$3.74
Grand Tot. Initial and Second Working All Types	114,690	49,500.9	15,122,664	72,573	$299,113.69			

*Second working was done on stream type only.

ANALYSIS OF RIBES ERADICATION DATA

In the 1931 annual reports for the Ribes eradication projects there were incorporated analyses of the Ribes eradication data. These analyses are

useful in the following ways. (1) in arriving at a standard by which to judge the volume of work which should be expected in the various types, (2) in any making a preeradication survey because such information serves as a gauge by which costs of treating on a given area can be accurately estimated, (3) in judging beforehand the type of equipment and number of men needed to work a given area in a given time. They are furthermore useful, knowing the Ribes and working conditions, in deciding whether or not it is economically feasible to attempt the control of blister rust on any given block of white pine timber.

Instead of including the individual analyses as was done in 1931, however, it was decided to throw all data together and construct one set to be included in the 1932 report. The following tables show the results:

useful in the following ways, (1) in arriving at a standard to judge the volume of work which should be expected in the [illegible] (2) in making a pre-eradication survey estimate [illegible] as a gauge by which costs of treating on a given area can be accurately estimated; (3) in judging beforehand the type of equipment and number of men needed to work a given area in a given time. They are furthermore useful, knowing the Ribes and working conditions, in deciding whether or not it is economically feasible to attempt the control of blister rust on any given stock of white pine timber.

Instead of including the individual analyses as was done in 19[illegible], however, it was decided to throw all data together and construct one table to be included in the 19[illegible] report. The following tables show the results:

A. Hand Pulling:

TABLE NO. 3

INITIAL WORKING BY TYPES, INLAND EMPIRE

Ribes Per Acre Class	Acres Worked	Man Days	Ribes Per Acre Pulled: R. lacustre	R. viscosissimum	R. petiolare	R. inerme	R. irriguum R. acerifolium	Total	Man Days Per Acre	Per Cent of Total For Type: Acres	Man Days	Ribes
Stream												
0-25	1,389	300.4	10.0	2.9	.4			13.3	.22	18.4	6.6	1.3
26-50	1,012	311.8	31.3	7.0	1.7	.3		40.3	.31	13.4	6.8	2.9
51-100	1,103	455.1	63.6	7.6	2.4	.9		74.5	.41	14.6	9.9	5.8
101-200	2,000	1,081.2	106.1	33.4	2.2	2.2		143.9	.54	26.5	23.5	20.7
201-400	1,185	941.1	238.3	19.5	7.8	4.3		269.9	.79	15.7	20.6	23.0
401-800	614	858.6	439.8	86.8	12.2	17.7		556.5	1.40	8.1	18.8	24.7
801-1600	218	498.2	757.4	154.3	41.8	116.7		1,070.2	2.29	2.9	10.9	16.8
1601-3200	25	101.5	1,653.3	80.1	46.7	206.1		1,986.2	4.06	.3	2.2	3.6
3201 and up	3	30.5	4,667.3	727.3	167.0	139.0		5,700.6	10.17	.1	.7	1.2
All	7,549	4,578.4	145.8	26.6	4.9	7.0		184.3	.61	100.0	100.0	100.0
Open Reproduction												
0-25	10,221	1,762.6	2.6	4.0	.1			6.7	.17	30.4	9.2	.9
26-50	3,171	1,030.8	12.7	25.7	.3	.1	.1	38.9	.33	9.4	5.4	1.6
51-100	4,844	1,987.7	27.4	47.0	.3	.1	.4	75.2	.41	14.4	10.3	4.9
101-200	5,617	3,182.8	54.9	90.6	1.3	.2	1.6	148.6	.57	16.7	16.5	11.1
201-400	5,413	4,126.7	85.2	177.7	1.9	.4	4.2	269.4	.76	16.1	21.4	19.5
401-800	2,279	2,643.0	135.4	399.3	2.0	2.3	6.7	545.7	1.16	6.8	13.7	16.6
801-1600	1,369	2,408.7	129.5	1,001.3	2.2	1.8	7.8	1,142.6	1.76	4.1	12.5	20.9
1601-3200	570	1,419.3	69.8	2,022.7	2.1	3.7	4.7	2,103.0	2.49	1.7	7.4	16.0
3201 and up	126	683.8	110.3	4,939.3	1.3			5,050.9	5.43	.4	3.6	8.5
All	33,611	19,245.4	44.9	174.8	.9	.4	1.9	222.9	.57	100.0	100.0	100.0
Dense Reproduction												
0-25	1,761	285.9	4.5	6.8	.4	.1		11.8	.16	42.0	17.8	6.0
26-50	710	243.4	14.3	24.4	.9	.6		40.2	.34	16.9	15.2	8.4
51-100	700	289.3	26.0	47.1	.5	1.1	.2	74.9	.41	16.7	18.0	15.4
101-200	530	324.1	56.8	80.0	.8	6.2	.3	144.1	.61	12.7	20.2	22.3
201-400	373	315.6	129.4	125.2	.3	4.7		259.6	.85	8.9	19.7	28.3
401-800	104	123.5	244.1	274.7	1.4	.4	13.0	533.6	1.19	2.5	7.7	16.2
801-1600	12	23.0	310.3	597.0	4.5		45.8	957.6	1.92	.3	1.4	3.4
All	4,190	1,604.8	34.3	44.7	.6	1.5	.5	81.6	.38	100.0	100.0	100.0
Open Pole												
0-25	483	53.7	4.9	6.9	.1			11.9	.11	26.2	7.2	1.3
26-50	312	71.3	18.9	14.2				33.1	.23	16.9	9.6	2.3
51-100	276	78.2	52.4	16.2	.2			68.8	.28	15.0	10.5	4.3
101-200	286	118.2	68.9	66.1	1.5			136.5	.41	15.5	15.8	8.8
201-400	209	122.5	147.2	103.6	2.3			253.1	.59	11.3	16.4	11.9
401-800	100	66.1	192.0	268.9	5.6			466.5	.66	5.4	8.9	10.5
801-1600	112	95.9	382.3	415.7	8.8			806.8	.86	6.1	12.9	20.3
1601-3200	44	77.5	884.5	757.1	32.7			1,674.3	1.76	2.4	10.4	16.6
3201 and up	23	61.8	660.6	3,981.1				4,641.7	2.69	1.2	8.3	24.0
All	1,845	745.2	102.6	136.1	2.2			240.9	.40	100.0	100.0	100.0

(Continued)

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TABLE NO. 3 (CONT'D.)

INITIAL WORKING BY TYPES, INLAND EMPIRE

Ribes Per Acre Class	Acres Worked	Man Days	Ribes Per Acre Pulled R. lacustre	R. viscosissimum	R. petiolare	R. inerme	R. irriguum R. acerifolium	Total	Man Days Per Acre	Per Cent of Total For Type Acres	Man Days	Ribes
					Dense Pole							
0-25	312	24.8	1.1	.7				1.8	.08	83.2	44.5	4.7
26-50	1	.8	5.0	37.0				42.0	.80	.3	1.4	.4
51-100	15	4.1	61.8	6.7				68.5	.27	4.0	7.3	8.5
101-200	26	12.7	30.7	98.2				128.9	.49	6.9	22.7	27.7
201-400	9	5.2	11.1	231.4				242.5	.58	2.4	9.3	18.1
401-800	12	8.3	14.5	394.4				408.9	.69	3.2	14.8	40.6
All	375	55.9	6.3	25.9				32.2	.15	100.0	100.0	100.0
					Open Mature							
0-25	19,769	2,160.5	7.1	1.4	.3	.1	.1	9.0	.11	64.3	31.1	9.4
26-50	2,296	574.2	41.4	2.0	.5	.5		44.4	.25	7.5	8.2	5.4
51-100	3,869	1,318.3	58.2	16.9	.6	.3	.3	76.3	.34	12.6	18.9	15.7
101-200	2,653	1,264.6	107.3	38.0	1.9	.6	.6	148.4	.48	8.6	18.1	20.8
201-400	1,422	860.2	178.7	96.8	5.3	.3	.7	281.8	.60	4.6	12.3	21.2
401-800	559	520.8	388.6	137.5	8.4	.2		534.7	.93	1.8	7.5	15.8
801-1600	143	189.1	653.7	392.2	4.4	11.4		1,061.7	1.32	.5	2.7	8.0
1601-3200	32	71.3	959.1	811.2	4.2	155.6		1,930.1	2.23	.1	1.0	3.3
3201 and up	2	11.0	3,760.0	5.0				3,765.0	5.50		.2	.4
All	30,745	6,970.0	43.8	16.2	.9	.4	.2	61.5	.23	100.0	100.0	100.0
					Dense Mature							
0-25	1,321	117.1	5.9	.3	.2		.1	6.5	.09	69.7	36.5	11.5
26-50	276	52.7	35.8	.5	.1			36.4	.19	14.6	16.4	13.2
51-100	143	38.6	62.8	11.5	.3		2.5	77.1	.27	7.5	12.0	14.6
101-200	48	20.0	109.4	17.3	.4	1.7	10.6	139.4	.42	2.5	6.2	8.8
201-400	84	66.1	304.6	.7	1.3			306.6	.79	4.4	20.6	34.0
401-800	21	21.4	457.4	.6				458.0	1.02	1.1	6.7	12.7
801-1600	3	5.0	1,301.3					1,301.3	1.67	.2	1.6	5.2
All	1,896	320.9	37.5	1.7	.2	.1	.5	40.0	.17	100.0	100.0	100.0
					Brush							
0-25	377	23.8	.2	5.6	.1			5.9	.06	28.5	1.8	.7
26-50	51	16.7		42.8				42.8	.33	3.8	1.3	.7
51-100	149	58.7	6.1	62.3	.1			68.5	.40	11.3	4.5	3.1
101-200	222	170.7	14.6	121.0	.8			136.4	.77	16.8	13.2	9.2
201-400	257	282.6	59.3	202.9	.6			262.8	1.10	19.4	21.8	20.5
401-800	173	507.1	77.5	405.4	.8	.6		484.3	2.93	13.1	39.1	25.5
801-1600	79	183.5	154.9	778.2	1.8			934.9	2.32	6.0	14.2	22.4
1601-3200	9	38.2	473.1	1,633.9				2,107.0	4.22	.7	3.0	5.6
3201 and up	5	14.1	803.2	6,685.2	601.8	2.8		8,093.0	2.82	.4	1.1	12.3
All	1,322	1,295.4	40.4	205.0	2.8	.1		249.3	.98	100.0	100.0	100.0
					All Types							
0-25	35,633	4,728.8	5.6	2.6	.3	.1		8.6	.13	43.7	13.6	2.5
26-50	7,830	2,301.7	24.7	15.0	.6	.3		40.6	.29	9.6	6.6	2.7
51-100	11,099	4,230.0	42.5	31.5	.6	.3	.3	75.2	.38	13.6	12.1	7.0
101-200	11,382	6,174.3	75.9	67.5	1.5	.9	1.0	146.8	.54	14.0	17.7	14.0
201-400	8,952	6,720.0	124.8	139.1	3.1	1.0	2.7	270.7	.75	11.0	19.4	20.2
401-800	3,862	4,748.8	223.6	303.1	4.5	4.2	4.3	539.7	1.23	4.7	13.6	17.4
801-1600	1,936	3,403.4	257.5	813.9	7.2	15.3	5.8	1,099.7	1.76	2.4	9.8	17.8
1601-3200	680	1,707.8	227.9	1,807.2	5.8	18.0	3.9	2,062.8	2.51	.8	4.9	11.7
3201 and up	159	801.2	343.6	4,714.1	23.1	2.7		5,083.5	5.04	.2	2.3	6.7
All	81,533	34,816.0	54.2	89.5	1.3	1.1	.9	146.9	.43	100.0	100.0	100.0

Annual Report, 1932
C. C. Strong

TABLE NO. 4

SECOND WORKING

Stream

Ribes Per Acre Class	Acres Worked	Man Days	Ribes Per Acre Pulled						Man Days Per Acre	Per Cent of Total For Type		
			R. lac.	R. vis.	R. pet.	R. inerm.	R. irrig. R. aur.	Total		Acres	Man Days	Ribes
0-25	1,268	146.3	9.3	.3	4.7	.1	.2	14.6	.11	34.0	10.7	4.3
26-50	622	135.3	23.2	.9	16.2	.5		41.0	.22	16.8	9.9	5.0
51-100	605	239.1	53.7	1.7	15.9	.7		72.0	.35	16.3	17.6	11.4
101-200	611	316.1	102.8	7.6	33.2	3.0	.4	146.5	.52	16.4	23.2	20.7
201-400	340	227.4	195.7	15.6	41.6	17.6	1.1	271.6	.67	9.1	16.7	21.4
401-800	132	149.6	346.8	23.4	84.2	71.6	.4	523.4	1.13	3.6	11.0	16.2
801-1600	58	112.3	671.2	137.6	104.9	137.5	9.2	1,050.4	1.94	1.6	8.3	14.5
1601-3200	9	32.9	1,595.0	74.2	275.9	201.3		2,325.5	3.66	.2	2.4	4.7
3201 and up	1	3.0	1,771.0		1,023.0	400.0		3,194.0	3.00		.2	.8
All	3,724	1,361.0	75.6	4.4	22.0	3.4	.4	115.6	.37	100.0	100.0	100.0
Open Reproduction*												
0-25	648	73.0	5.2	10.1				16.3	.11	95.1	72.3	88.1
26-50	25	11.0	13.7	27.4				41.1	.44	3.7	10.9	6.9
51-100	8	17.0	71.2	1.2				72.4	2.13	1.2	16.8	5.0
All	681	101.0	6.2	10.6				16.9	.15	100.0	100.0	100.0
Open Mature*												
0-25	102	13.0	5.5	6.6				12.1	.13	80.5	65.0	50.1
26-50	16	4.0	18.7	15.8				34.5	.25	12.5	20.0	22.2
51-100	9	3.0	34.3	42.2				76.5	.33	7.0	15.0	27.7
All	128	20.0	9.2	10.2				19.4	.16	100.0	100.0	100.0

*This is reworking on areas initially worked the same season, 1932. It is area shown by checkers to need reworking. Hence it is shown in the progress summary as initial work although, of course, the acreage was not added. However, it is shown in the analysis as reworking to provide figures to compare with those for initial working.

B. Spraying:

TABLE NO. 5

SPRAYING

Initial Spraying

Eradication Class, Gals. Spray Per Acre	Acres Worked	Man Days	Per Acre Basis: Man Days	Per Acre Basis: Gallons Spray	Gallons Spray Per Man Day	Per Cent of Total: Acres	Per Cent of Total: Man Days	Per Cent of Total: Gallons Spray
0-5	[illegible]	25.0	.39	3.1	10.3	6.7	2.0	.7
6-10	113	55.0	.49	8.1	17.3	11.9	4.4	2.7
11-20	247	179.5	.73	15.8	21.6	26.1	14.3	11.1
21-40	240	280.8	1.15	30.0	26.2	25.0	22.5	31.0
41-80	150	277.3	1.81	54.0	29.5	15.8	21.7	33.0
81-160	85	306.0	3.59	113.2	31.5	9.0	24.4	27.4
161-220	23	121.5	5.28	197.8	37.4	2.4	9.7	13.[illegible]
221 and up	1	13.0	13.00	410.0	31.5	.1	1.0	1.8
All Classes	947	1,253.0	1.32	37.1	28.1	100.0	100.0	100.0
Second Spraying								
0-5	1,107	111.0	.10	.9	8.8	74.1	20.5	11.8
6-10	113	76.0	.68	8.1	11.9	7.5	14.0	10.4
11-20	133	140.9	1.12	16.3	14.9	8.9	26.0	24.2
21-40	110	141.2	1.28	26.2	20.4	7.4	26.1	33.1
41-80	29	59.9	2.07	60.9	34.0	1.9	11.1	18.9
81-160	3	13.0	4.33	121.0	27.9	.2	2.3	4.2
All Classes	1,494	540.0	.36	8.8	15.1	100.0	100.0	100.0

TABLE NO. [illegible]

RIBES ANALYSIS - MOUNT RAINIER NATIONAL PARK, 1932*

Ribes Per Acre Class	Acres	Man Days	Ribes Per Acre Pulled: R. brac.	R. lac.	R. lax.	R. acer.	R. vis.	R. wat.	R. sang.	Total	Man Days Per Acre	Per Cent of Total for Type: Acres	Man Days	Ribes
Stream Type														
0-25	24.0	2.5		3.2	3.3		1.5	.7		7.7	.10	5.1	.2	.1
26-50	33.2	22.0	29.5	3.7	.1	2.6	1.2	1.7		38.8	.66	7.1	1.8	.9
51-100	90.7	70.5	51.4	27.5		1.9				80.8	.78	19.4	5.7	4.3
101-200	117.5	160.5	101.2	46.2	1.5	2.0		1.4		152.3	1.37	25.2	12.9	11.8
201-400	80.5	210.3	172.2	101.3	.6	2.0		.2		276.2	2.61	17.2	16.8	14.7
401-800	71.2	317.5	417.7	116.0	4.0	8.7	1.4	2.3	.2	550.3	4.46	15.2	25.4	25.7
801-1600	40.7	356.1	740.4	277.5	7.5	17.1	1.5	.3	.4	1,045.5	9.01	8.7	28.5	30.1
1601-3200	8.2	113.9	2,036.0	73.4	10.9					2,120.3	13.89	1.8	9.1	11.5
3201+	.9	25.0	2,923.3	1.1	72.2					2,996.6	27.78	.2	2.0	2.4
Totals or Averages	466.9	1,248.3	238.7	73.0	2.2	4.3	.6	1.0	.1	324.9	2.67	100.0	100.0	100.0
Open Reproduction														
0-25	28.0	4.0				5.5	.2			5.7	.14	49.5	14.8	7.3
26-50	8.1	3.0		.6		28.9				29.5	.37	14.3	11.1	7.2
51-100	2.3	2.0		5.2		85.2				90.4	.87	4.1	7.4	6.3
101-200	12.5	10.0		74.3		42.3				116.6	.80	22.1	37.1	43.5
201-400	5.5	8.0		7.3		201.3	.4	1.1		210.1	1.43	9.8	29.6	35.4
Totals or Averages	56.6	27.0		17.5		41.1	.1	.1		58.8	.48	100.0	100.0	100.0
Open Pole														
0-25	86.9	16.0		1.4	.1	12.0	2.5	.5		16.5	.18	26.2	6.1	3.3
26-50	94.5	31.0		1.4		39.6	.3	.3		41.6	.33	28.5	11.9	8.0
51-100	62.7	31.0		6.2	.4	54.3	3.3	2.2		67.4	.49	18.9	11.9	9.8
101-200	41.0	31.0		13.2	3.3	79.4	15.6	23.5		135.7	.76	12.3	11.9	12.7
201-400	28.3	44.0		39.7	5.8	127.5	28.9	57.1		259.8	1.55	8.5	16.8	16.6
401-800	5.3	15.5		248.9	64.9	150.3	48.3	69.8		629.2	2.92	1.6	5.9	7.6
801-1600	10.7	61.0		408.6	118.2	41.2	328.4	209.9		1,106.2	5.70	3.2	23.3	27.0
1601-3200	2.6	33.0		1,101.8	449.6		147.9	436.1		2,225.4	11.43	.8	12.8	14.2
Totals or Averages	332.3	261.5		23.9	9.7	50.1	13.5	19.9		172.1	.79	100.0	100.0	100.0

*Placed here so that it can be most conveniently compared with Idaho data.

Tables showing analyses of initial hand pulling and spraying do not include all of the data for the St. Joe National Forest. Time permitted including results of work for only 6 of the 13 camps. However, the data for the ones included are representative of the data for the entire group of camps.

CHECKING

Checking of work done in 1932 for the purpose of insuring work of a high standard was done by men trained for that work. They worked under the direction of the supervisor of the damage studies project. Roughly, one man was assigned to each two Ribes eradication camps.

The adoption of a scientifically proven standard by which to judge the pathological effectiveness of control measures for the Inland Empire white pine belt is impossible at this time. Hence an arbitrary standard was adopted. Briefly the decision was that areas having more than 50 feet of Ribes live stem per acre remaining after initial treatment should be reworked. This was the plan followed in 1932. However, the aim on Ribes eradication work is not merely to reduce Ribes to the 50-foot limit but rather to destroy positively all Ribes. It is a well known fact, of course, that the removal of all Ribes, while theoretically possible, is seldom accomplished in actual practice.

The individual reports follow.

CHECKING AFTER RIBES ERADICATION

By
E. L. Joy
Junior Forester

INTRODUCTION

The effectiveness of Ribes eradication in protecting white pines from blister rust is measured by the quantity of Ribes left. This amount, even though only a fraction of a per cent of the original quantity, may still be sufficient to cause serious damage to the adjacent white pines. Therefore, it is necessary to know the status of the Ribes population after eradication in terms of quantities left.

PURPOSE

It is the purpose of checking to determine the quantities of Ribes on areas after eradication.

METHOD

Only by an impartial system of sampling can a fair estimate be made of the Ribes quantities on an area. The method employed in 1932 consisted of a percentage cruise by .2 chain (13.2 feet) wide strips run at regular intervals through the areas eradicated of Ribes. By spacing these strips 20 chains apart 1 per cent of the area was covered; 10 chains, 2 per cent; 5 chains, 4 per cent; and 2-1/2 chains 8 per cent.

In running the strips a box compass was used for line direction and pacing for distance. The strip data which were recorded by one chain segments consisted of the type and the number of Ribes bushes and feet of live stem found according to species.

Data were recorded by chain segments in order to delimit the part or parts of a block on which Ribes were most abundant. From this information it was possible to confine the necessary reworking to only the high count areas, which in most cases are small.

The data collected on the several strips of a block were compiled and the number of Ribes bushes and feet of live stem per acre by species were computed for each type. This information was available for the eradication supervisors' use in determining whether the area or parts thereof needed reworking.

At the close of the field season the block data for each camp were combined into a camp summary. These results also show the Ribes per acre by type.

[illegible]

by

W. L. [illegible]

Junior Forester

[illegible]

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[illegible]

It is the purpose of [illegible] to [illegible] the conditions of Ribes on areas after eradication.

[illegible]

Only by an impartial system of sampling can a fair estimate be made of the Ribes quantities on an area. The method [illegible] consisted of a percentage cruise by .2 chain (13.2 feet) wide strips run at regular intervals through the areas eradicated of Ribes. By spacing these strips 20 chains apart 1 per cent of the area was covered; 10 chains, 2 per cent; 5 chains, 4 per cent; and 2-1/2 chains 8 per cent.

In running the strips a box compass was used for line direction and pacing for distance. The strip data which were recorded by one chain segments consisted of the type and the number of Ribes bushes and feet of live stem found according to species.

Data were recorded by chain segments in order to delimit the part or parts of a block on which Ribes were most abundant. From this information it was possible to confine the necessary reworking to only the high count areas, which in most cases are small.

The data collected on the several strips of a block were compiled and the number of Ribes bushes and feet of live stem per acre by species were computed for each type. This information was available for the eradication supervisors' use in determining whether the area or parts thereof needed reworking.

At the close of the field season the block data for each camp were combined into a camp summary. These results also show the Ribes per acre by type.

During the period June 15-30 the temporary personnel assigned to checking were trained on the areas worked in 1931 and 1932 on the Priest Lake Timber Protective Association. Both the thorough training of checkers and a satisfactory check of these areas resulted from the work done during this period. In addition, two days of systematic scouting gave the men experience in this field. Since no blister rust was found, this work gave additional evidence that pine infection is not abundant in the Priest Lake region.

The checking results have been compiled and reported for each of 6 major working units. These reports, the titles of which follow, will be found after the Ribes eradication reports for these units.

1. Checking after Ribes Eradication on the Savenac Nursery Protection Area, Haugan, Montana.

2. Checking after Ribes Eradication, Clearwater National Forest.

3. Checking after Ribes Eradication, St. Joe National Forest.

4. Checking after Ribes Eradication, Clearwater Timber Protective Association.

5. Checking after Ribes Eradication, Upper St. Maries River Area.

6. Checking after Ribes Eradication, Priest Lake Timber Protective Association.

In summary of the checking on the five forest units (all working units except the Savenac Nursery protection area) there has been computed the percentage of the checked stream type, upland types and all types of each unit that had not to exceed 100, 50 and 25 feet of live stem per acre after eradication. These data are shown in Table No. 1.

In most cases, a much higher percentage of the upland acreage was brought within the 50 foot limit. Here again it is evident that the 1932 work was, in general, far superior to the work done in 1931.

The one unit worked in 1932 that showed a decrease in the acreage under 50 feet of live stem per acre is the Priest Lake Timber Protective Association. This was mainly the result of a decision against reworking a large acreage of open mature timber that ran 100 feet of Ribes lacustre live stem per acre. It was felt that this amount in mature timber would not be a serious blister rust factor and that these Ribes would be rapidly shaded out.

During the period June 15-30 the temporary personnel assigned to checking were trained on the areas worked in 1951 and 1952 on the Priest Lake Timber Protective Association. Both the thorough training of checkers and a satisfactory check of these areas resulted from the work done during this period. In addition, two days of systematic scouting gave the men experience in this field. [illegible] additional evidence that [illegible] region.

The checking results have been compiled and reported [illegible] 6 major working units. These reports, the titles of which follow, will be found after the Ribes eradication records for these units.

1. Checking after Ribes Eradication on the Savenac Nursery Protection Area, Haugan, Montana.

2. Checking after Ribes Eradication, Clearwater National Forest.

3. Checking after Ribes Eradication, St. Joe National Forest.

4. Checking after Ribes Eradication, Clearwater Timber Protective Association.

5. Checking after Ribes Eradication [illegible] Area.

6. Checking after Ribes Eradication, Priest Lake Timber Protective Association.

In summary of the checking on the five forest units (all working units except the Savenac Nursery protection area) there has been computed the percentage of the checked stream type, upland type, and all types of each unit that had met [illegible] after eradication. These data are shown in Table No. 1.

TABLE NO. 1

PERCENTAGE OF CHECKED ACREAGE THAT SUPPORTED VARIOUS AMOUNTS OF RIBES LIVE STEM PER ACRE AFTER ERADICATION

Unit	Year of Eradication	Per Cent of Acreage with Ribes Live Stem Per Acre Not to Exceed								
		100 Feet			50 Feet			25 Feet		
		Stream Type	Upland Types	All Types	Stream Type	Upland Types	All Types	Stream Type	Upland Types	All Types
Clearwater Nat. Forest	1932	22.0	93.9	89.3	18.4	81.9	78.7	7.9	44.1	42.2
	1931	4.6	0.6	1.3	4.6	0.6	1.3	4.6	0.5	1.0
St. Joe Nat. Forest	1932	97.2	100.0	99.9	75.7	96.8	95.8	34.8	75.4	73.4
Clearwater T.P.A.	1932	84.1	96.2	95.0	0.0	74.8	67.5	0.0	37.6	34.0
Upper St. Maries River Area	1932	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	95.2
	1931	0.0	58.8	57.9	0.0	13.7	13.5	0.0	1.4	1.4
Priest Lake Timber Protective Association	1932	57.0	96.5	95.9	0.0	55.7	54.8	0.0	50.8	50.0
	1931	0.0	86.2	84.2	0.0	66.0	64.5	0.0	48.4	47.3
	1929	0.0	88.8	82.4	0.0	81.0	75.3	0.0	58.8	54.6
All Units	All Yrs.	44.6	86.6	84.3	19.5	71.3	68.5	8.7	46.2	44.2

Since a maximum of 50 feet of Ribes live stem per acre was adopted arbitrarily to denote protection of white pines, it is seen in Table No. 1 that on only 2 of the 8 units worked in 1931 and 1932 was there any appreciable amount of stream type worked to the protection status. It is notable that both of these units were eradicated of Ribes in 1932.

In most cases, a much higher percentage of the upland acreage was brought within the 50 foot limit. Here again it is evident that the 1932 work was, in general, far superior to the work done in 1931.

The one unit worked in 1932 that showed a decrease in the acreage under 50 feet of live stem per acre is the Priest Lake Timber Protective Association. This was mainly the result of a decision against reworking a large acreage of open mature timber that ran 100 feet of <u>Ribes lacustre</u> live stem per acre. It was felt that this amount in mature timber would not be a serious blister rust factor and that these Ribes would be rapidly shaded out.

Since it was tentatively agreed that the white pines on areas supporting not to exceed 50 feet of Ribes live stem per acre were to be classed as protected, it is seen in Table No. 1 that on only 1 of the [illegible] areas worked during the last 2 years was there any appreciable amount of stream type worked to the protection status.

Of unusual interest are the data for the Priest Lake Timber Protective Association area worked in 1928, 4 years before this check. Although all of the stream type was found to support over 100 feet per acre, 81 per cent of the upland type falls within the 50 foot classification and 59 per cent within the 25. In this connection, it is important to note that about two-thirds of the upland acreage is in the open mature and cut-over types.

Class II was relatively absent from the white pine ... areas supporting not to exceed 50 feet of [illegible] per acre which classed as protected. It is seen in Table No. 8 that [illegible] only [illegible] of the areas worked during the last 2 years was there any appreciable amount of stream type worked to the protection status.

Of unusual interest are the data for the Priest Lake Timber Protective Association area worked in 1935, 4 years before this check. Although all of the stream type was found to support over [illegible] 81 per cent of the upland type falls within the 50 foot classification and 39 per cent within the 25. In this connection, it is important to [illegible] about two-thirds of the upland acreage is in the open mature and cut-over types.

CHEMICAL ERADICATION METHODS

By
Herman E. Swanson
Agent
John F. Breakey
Agent

INTRODUCTION

The program of the chemical eradication methods unit consisted of a check on the experimental work performed in 1931 and further experimentation with chemicals and methods of application.

A. Check on the Experimental Plots Established in 1931.

1. Special plot studies testing:

a. Effect of variations in volume of water in sodium chlorate solutions used per unit of area compared with the effect of variations in weight of sodium chlorate.

b. Toxicity of various chemicals applied in dry form to the soil.

2. Extensive work testing:

a. Seasonal toxicity of 5 per cent, 7-1/2 per cent and 10 per cent concentrations of weight of Atlacide and sodium chlorate sprays.

b. Effectiveness of Atlacide and sodium chlorate when applied to aerial portions of Ribes bushes and to the soil. Second treatment of *Ribes inerme* areas with these solutions during current season.

c. Atlacide applied in form of dust.

d. Stem, root and crown injections of copper complex.

e. Salt applications to the soil.

B. The 1932 Program for the Further Development of Chemical Eradication Methods

1. Special plot studies testing:

a. Effectiveness of sodium chlorate and ammonium thiocyanate solutions when applied to aerial portion of Ribes bushes and to the soil, also when applied to the soil only.

b. Effect of variations in volume of water in chemical solutions used per unit of area compared with the effect of variations in the weight of chemicals.

c. Variations in effectiveness of chemicals as influenced by the time of season.

d. Successive treatments of areas during current season.

e. Application of ammonium thiocyanate in dry form to the soil.

f. Best utilization of chemical measured by the treatment of individual bushes.

2. Extensive work testing:

a. Broadcast applications or drenches on _R. inerme_ areas using 1-1/4 per cent, 3-1/3 per cent and 5 per cent solutions by weight of sodium chlorate. Second treatment of parts of areas so treated.

b. Selective applications to aerial portion of _R. inerme_ and to the soil with 5 per cent and 10 per cent solutions by weight of sodium chlorate. Second applications to Ribes so treated.

c. Second treatments to areas, originally treated with 5 per cent solution of sodium chlorate in 1931, with 10 per cent solutions of either sodium chlorate or ammonium thiocyanate.

d. Use of ammonium thiocyanate by a regular eradication crew throughout the season for spraying _R. petiolare_.

LOCATION AND DESCRIPTION OF AREA

The experiments were conducted on Orogrande Creek on the Clearwater National Forest 5 to 6 miles from the Bungalow Ranger Station. This area is a few miles below that on which the 1931 work was performed. Very heavy concentrations of _R. inerme_ covered the wide flat bottom bordering the creek. _R. petiolare_ and _R. lacustre_ were less widely distributed. The stream type was representative of the conditions under which _R. inerme_ is found, with dense patches of willow, alders, thorn brush and other deciduous vegetation growing in close association with the Ribes. In general, the working conditions were very difficult.

b. Effect of variations in volume of water in chemical solutions used per unit of area compared with the effect of variations in the weight of chemicals.

c. Variations in effectiveness of chemicals as influenced by time of season.

d. Successive treatments of [illegible].

e. Application of ammonium thiocyanate in dry form to the soil.

f. Best utilization of chemical measured by the treatment of individual bushes.

2. Extensive work [illegible]:

a. Broadcast applications or drenches on B. inerme [illegible] 1-1/2 per cent [illegible] weight of sodium chlorate. Second treatment of [illegible] so treated.

b. Selective applications to aerial portion of B. inerme and to the soil with 5 per cent and 10 per cent solutions by weight of sodium chlorate. [illegible].

c. Second treatments to areas [illegible] in 1931, with 10 per cent solutions of either sodium [illegible].

d. Use of ammonium thiocyanate [illegible] throughout the season [illegible].

LOCATION AND DESCRIPTION OF AREA

The experiments were conducted on [illegible] Creek on the [illegible] National Forest 5 to 6 miles from the [illegible] Ranger Station. This area is a few miles below that on which the 1931 work was performed. Very heavy concentrations of B. inerme [illegible] B. petiolare and B. lacustre were less [illegible]. The area was representative of the conditions under which B. inerme [illegible], with dense patches of willow, alders, thorn brush and other deciduous [illegible] growing in close association with the Ribes. In general, the working conditions were very difficult.

ORGANIZATION AND COST OF WORK

The work was carried on by a crew of ten men.

TABLE NO. 1

STATEMENT OF EXPENDITURES
CALENDAR YEAR 1932

Item of Expenditure		Cost: Per Item	Cost: Total
Salaries and Wages	Permanent Men	$1,636.66	
	Temporary Field Men	2,496.26	$4,132.92
Subsistence	Wages, Cooks and Flunkies	235.44	
	Cost of Food	600.92	
	Transportation of Food	81.35	917.71
General Equipment	Cost	4.75	
	Transportation	9.04	13.79
Chemical Equipment	Cost	229.19	
	Repairs	148.87	
	Transportation	12.97	391.03
Chemical	Cost	1,291.04	
	Transportation	383.87	1,674.91
Miscellaneous	Twine and other Supplies	15.57	
	Travel and Transportation	212.02	
	Expenses	58.60	286.19
Total of All Expenditures			$7,416.55

METHODS AND EQUIPMENT

A. Checking

The method of recording the results in 1932 differed from that used in the preliminary sample checks made in 1931. In 1931 the basis was the total amount of Ribes stem examined. This stem was classified as dead, questionable, or alive, which was determined by the condition of the particular bush or root system to which the stem was directly attached. The effectiveness was not measured by the number of bushes, but by the total stem in each bush condition class. In 1932, the basis of the check on the 1931 work was the number of bushes and the feet of stem dead or alive. This method was possible since a great deal of the uncertainty as to the survival of the Ribes had been eliminated. However, the matter of determining what constitutes a bush is subject to wide variation of interpretation. In considering the number of bushes and the feet of stem as units of measure of effectiveness, one must keep in mind that the true effectiveness of the treatments are probably greater than that indicated by the per cent of bushes dead and less than that indicated by the per cent of stem dead. The

The work was carried on by a crew of ten men.

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reason for this is that when a particular concentration of Ribes apparently coming from one central root system is killed, it is counted as one dead bush. On the other hand, if the chemical failed to destroy this concentration and resprouting took place at more than one point on layered stems or crowns two or more bushes with independent root systems might result which would be counted accordingly.

Although it is the aim of this project to set an accurate measure of the effectiveness or toxicity of the chemicals used, there are other important considerations which such measures do not show. Some of the treatments, while not completely suppressing the Ribes growth on an area, may serve to open up a difficult area and destroy the Ribes sufficiently for working by hand pulling methods.

As the system of checking used in 1931 is a laborious process and destroys the value of the plots in so far as the number of bushes pulled out is concerned, it was not used in checking the current season's work in 1932. It is believed that for the purposes of a preliminary check a measure of the Ribes stem, classified as dead, questionable, or alive is satisfactory.

Preliminary checks or inspections were made on all areas treated in 1932 and where the action of the chemical was sufficiently advanced to show definite results the data were recorded. However, any inspection made during the current season permits only a qualified statement as to the condition of the Ribes and the probable final results which may or may not be in accord with the true results obtained by an inspection made the following year.

B. Spraying Methods

Three different methods were used to treat the Ribes with chemical, each requiring a certain type of equipment.

1. Hand spraying. Portable knapsack spraying outfits were used for the special plot studies and for some of the selective work on respraying.

2. Selective power spraying. This method is similar to that used on power work during the past seasons requiring a crew of about 7 men, including a foreman and mechanic. The equipment used in this method is most satisfactory when only the Ribes are treated with concentrated solutions.

3. Broadcast power spraying. This method was first employed in 1932 for the suppression of Ribes. A crew of 4 men were used, a foreman, mechanic, and 2 nozzle men. The purpose was to drench all the soil on an area where there might be Ribes. Only those spots which obviously held no Ribes were eliminated from the drenching. The foliage of all Ribes and brush was sprayed along with drenching the soil. The equipment used in this method is described in the report on "Development of Ribes Eradication Equipment". It is most

reason for this is that when a particular concentration of Ribes apparently coming from one central root system is killed, it is counted as one dead bush. On the other hand, if the chemical failed to destroy that concentration and resprouting took place at more than one point on [illegible] or more bushes with independent root systems [illegible] counted accordingly.

Although it is the aim of this project to get an accurate [illegible] of the effectiveness or toxicity of the chemicals used, there are other important considerations which such measures do not show. Some of the treatments, while not completely suppressing the Ribes growth on an area, serve to open up a difficult area [illegible] working by hand pulling methods.

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Preliminary checks or inspections were made on all areas treated in 1951 and where the action of the chemical was sufficiently advanced to give definite results the data were recorded. However, any inspection made during the current season permits only a tentative statement as to the condition of the Ribes and the probable final results which may or may not be in accord with the true results obtained by an inspection made the following year.

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satisfactory for applying dilute solutions of chemical in large volumes.

DESCRIPTION OF TERMS

For the purpose of clarifying any uncertainty that may arise in the interpretation of some of the terms used in this report the following explanations are presented:

1. Questionable. This term when used in connection with Ribes stem refers to that stem which has been injured by the application of chemical but there is some doubt as to whether it will survive the treatment.

2. Special plot studies. These studies were controlled, the size of the plots were definitely fixed, treatments were made according to a definite amount per unit of area, and all possible variables were controlled and recorded. Data are presented on a square rod basis and all treatments constituted a complete uniform coverage of the plot regardless of the distribution of the Ribes thereon.

3. Intensive work. This work represented a practical job. Men were instructed and coached to give areas certain types of treatment. There was no way of controlling the exact amounts of chemical applied per unit of area or the manner in which the chemicals were applied. Data on this work are presented on a per acre basis. The treatments given do not constitute a complete coverage of the ground.

4. Selective spraying. This refers to the customary method of working an area. The men look over the entire ground for Ribes, applying chemical only to the Ribes or the area supporting Ribes. In this method, acres worked refers to the number of acres looked over by the men.

5. Broadcast spraying. This method of spraying calls for the drenching of all brush and ground which contain or might contain Ribes. Only areas obviously having no Ribes are eliminated from the treatment. In this method, acres worked refers to the number of acres treated.

6. Measurement of area. In the body of this report data are presented on a square rod basis when the treatments constituted a complete uniform coverage of the area. Data are presented on an acre basis when the treatments do not constitute a complete uniform coverage. The number of acres worked refers to the area looked over by the crews. The actual area treated with chemicals is unknown. However, in the case of broadcast spraying, the number of acres worked represents approximately the number treated, but the treatments were not uniform over the entire area as in the case of the square rod plots. The amount of chemical applied to certain spots was varied with the amount of Ribes present and the physical characteristics of the ground.

satisfactory for applying dilute solutions of chemical in large volumes.

[illegible]

For the purpose of clarifying [illegible] the interpretation of some of the terms used in this report the following explanations are presented:

1. Questionable. This term when used in connection with Ribes sites refers to that site which [illegible] there is some doubt as to whether it will survive the treatment.

2. Special plot studies. These studies were controlled, the size of the plots were definitely fixed, [illegible] amount per unit of area, and all possible variables were controlled and recorded. Data are presented on a square rod basis and all treatments constituted a complete uniform coverage of the plot regardless of the distribution of the Ribes thereon.

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4. Selective spraying. This refers to the customary method of [illegible] [illegible] only to the Ribes or the area supporting Ribes. In this method, acres worked refers to the number of acres looked over by the men.

5. Broadcast spraying. This method of spraying calls for the [illegible] [illegible] acres worked refers to the number of acres treated.

6. Measurement of area. In the body of this report data are presented [illegible] coverage of the area. Data are presented on an acre basis when the treatments do not constitute a complete uniform coverage. The number of acres worked refers to the area looked over by the crews. The actual area treated with chemicals is unknown. However, in the case of broadcast spraying, the number of acres worked represents approximately the number treated, but the treatments were not uniform over the entire area as in the case of the square rod plots. The amount of chemical applied to certain spots was varied with the amount of Ribes present and the physical characteristics of the ground.

7. Weights of chemical used in solutions:

Solution	Atlacide	Sodium Chlorate	Ammonium Thiocyanate
5%	0.7 lb. per gal.	.5 lb. per gal.	.5 lb. per gal.
7½%	1.0 " " "	.75 " " "	-
10%	1.4 " " "	1.0 " " "	1.0 " per gal.
15%	-	-	1.5 " " "

WORK PERFORMED AND RESULTS

I. Results of 1931 Work

A. Sodium Chlorate Used in Solution for Soil Drenches.

1. Purpose. To test the effectiveness of sodium chlorate on all Ribes species when applied in solution as a soil drench in amounts ranging from one-half pound to 4 pounds per square rod and in volumes of water ranging from 2 gallons to 32 gallons per square rod.

2. Method. The drenches were applied to the soil only and no treatment was given the aerial portion of the Ribes.

TABLE NO. 2

RESULTS OF SOIL DRENCHES ON SQUARE ROD PLOTS

Plot No.	Application		R. petiolare				R. inerme				R. lacustre				Per Cent Brush Kill	Dead-lines
	Pounds $NaClO_3$	Gals. Water	Bushes		Feet Stem		Bushes		Feet Stem		Bushes		Feet Stem			
			Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live		
1	.5	2	-	-	-	-	0	75	600	2,400	-	-	-	-	0-25	0
2	.5	4	-	-	-	-	0	72	421	800	-	-	-	-	50-75	0
3	.5	8	-	-	-	-	0	12	67	65	0	1	12	4	25-50	0
4	.5	16	0	9	194	351	0	19	116	299	-	-	-	-	0-25	0
5	.5	32	-	-	-	-	0	36	302	534	0	5	72	34	25-50	0
6	1.0	2	-	-	-	-	0	84	312	1,824	-	-	-	-	25-50	0
7	1.0	4	0	7	357	53	0	37	453	266	-	-	-	-	25-50	0
8	1.0	8	0	2	7	11	0	43	66	218	-	-	-	-	0-25	3-1
9	1.0	16	-	-	-	-	1	18	82	188	30	25	285	17	25-50	0
10	1.0	32	-	-	-	-	0	2	0	11	1	39	40	114	0-25	0
11	2.0	2	2	0	463	0	3	6	71	47	3	4	33	10	50-75	3-1
12	2.0	4	-	-	-	-	-	-	-	-	34	36	453	89	75-100	3-1
13	2.0	8	-	-	-	-	5	38	471	351	-	-	-	-	25-50	1-1
14	2.0	16	-	-	-	-	0	38	101	367	-	-	-	-	75-100	0
15	2.0	32	2	0	63	0	0	15	387	107	-	-	-	-	50-75	0
16	4.0	4	-	-	-	-	4	20	201	187	0	4	13	11	75-100	1-1
17	4.0	8	10	1	333	5	1+	6	375	38	-	-	-	-	100	0
18	4.0	16	-	-	-	-	4	16	313	178	-	-	-	-	100	0
19	4.0	32	-	-	-	-	6	50	1,017	635	-	-	-	-	75-100	0

I - R. inerme; L - R. lacustre
Applications made August 20-25, 1931.
Plots checked August 1-5, 1932.

3. Results. See Table No. 2. The treatments were made late in the season in 1931 which would tend toward poor results. Certain indications are shown in the results which will be helpful in planning future experimental work. No appreciable kill was secured with applications at the rate of one-half and one pound of chemical per square rod on either Ribes or other brush species. On the plots receiving these amounts of chemical there was not only sprouting from the Ribes crowns, but there was a considerable amount of survival of the original Ribes stem. On those plots receiving 2 pounds and 4 pounds of chemical a considerable amount of damage was done to all the brush on the area and in practically all cases the original Ribes stem was killed. Resprouting was all from the crowns. Attention is called to plots Nos. 12 and 17 on which 2 pounds of chemical in 4 gallons of water and 4 pounds of chemical in 8 gallons of water were applied, each mixture representing approximately a 5 per cent solution. A very good kill was secured on both plots. In regard to volume of water applied, 4 gallons per square rod seems to be insufficient, and amounts over 16 gallons per square rod apparently do not accomplish any additional kill.

b. Application of Chemicals in Dry Form to the Soil.

1. Purpose. To test the effectiveness of varying amounts of chemicals applied in dry crystalline form on areas with heavy Ribes concentrations. The experiments are outlined on the basis of a maximum cost figure of $300 per acre and a minimum figure of $50 for material, transportation and labor.

2. Method. The chemicals were scattered broadcast by hand on square rod plots. The applications were made to give a uniform ground coverage over the entire plot.

The following chemicals were used: sodium chlorate, ammonium chloride, sodium hydroxide, zinc chloride, and calcium chloride.

3. Results. See Table No. 8. This [illegible] season in 1951 which would tend [illegible] shown in the results which will be [illegible] work. The [illegible] will [illegible] half and one pound of [illegible] species. On the plots [illegible] sprouting from [illegible] survival of the [illegible] 4 pounds of [illegible] brush on the area and [illegible] killed. [illegible] Nos. 14 and 17 on which [illegible] of chemical in [illegible] gallons of water [illegible] approximately [illegible] per cent [illegible] plots. In regard to volume of water applied, [illegible] to be insufficient, and amounts over [illegible] gallons per [illegible] not necessary [illegible] additional kill.

4. Application of Chemicals to [illegible]

1. [illegible]. In this [illegible] applied [illegible] with [illegible] and a [illegible]

2. Method. The chemicals were [illegible] plots. The applications were made [illegible] entire plot.

The following chemicals were [illegible] sodium [illegible], plus [illegible], and [illegible].

TABLE NO. 3

RESULTS OF APPLICATIONS OF CHEMICALS IN DRY FORM ON SQUARE ROD PLOTS

Plot No.	Chemicals Applied		*R. petiolare*				*R. inerme*				*R. lacustre*				Per Cent Brush Kill	Se[illegible] lin[illegible]
			Bushes		Feet Stem		Bushes		Feet Stem		Bushes		Feet Stem			
	Pounds	Chemical	Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live		
1	21 29	$NaClO_3$ $CaCl_2$	4	0	142	0	20	3	591	78	12	1	361	1	50-75	26-i
2	10 15	$NaClO_3$ $CaCl_2$	32	4	439	55	1	9	21	117	-	-	-	-	25-50	131-i
3	5 7-1/2	$NaClO_3$ $CaCl_2$	5	2	211	57	4	10	194	166	4	3	97	30	25-50	C
4	8-1/4 41-3/4	$NaClO_3$ $CaCl_2$	12	5	164	65	4	4	159	58	-	-	-	-	75-100	6-i
5	4 21	$NaClO_3$ $CaCl_2$				not	chec	ked							0	
6	2 10-1/2	$NaClO_3$ $CaCl_2$				not	chec	ked							0	
7	25 25	NH_4Cl $CaCl_2$				not	chec	ked							0	
8	2-1/2 47-1/2	$NaClO_3$ $CaCl_2$				not	chec	ked							0	
9	2 23	$NaClO_3$ $CaCl_2$	8	14	618	536	0	8	147	143	-	-	-	-	0	60-p 2-i
10	1-1/2 11	$NaClO_3$ $CaCl_2$				not	chec	ked							0	
11	6-1/4 18-3/4	NH_4Cl $CaCl_2$				not	chec	ked							0	
12	1-1/4 11-1/4	NH_4Cl $CaCl_2$	0	23	47	359	-	-	-	-	0	5	1	42	0	0
13	3-1/8 9-3/8	NH_4Cl $CaCl_2$	0	63	203	1,557	-	-	-	-	0	7	4	66	0	0
14	12-1/2 37-1/2	NH_4Cl $CaCl_2$	0	15	67	189	0	1	0	5	-	-	-	-	0-25	50-i
15	12-1/2 12-1/2	NH_4Cl $CaCl_2$				not	chec	ked							0	
16	6-1/4 6-1/4	NH_4Cl $CaCl_2$				not	chec	ked							0	
17	2-1/2 22-1/2	NH_4Cl $CaCl_2$				not	chec	ked							0	
18	1-1/4 23-3/4	NH_4Cl $CaCl_2$				not	chec	ked							0	
19	5 45	NH_4Cl $CaCl_2$				not	chec	ked							0	
20	2-1/2 47-1/2	NH_4Cl $CaCl_2$	0	53	134	642	0	15	7	205	-	-	-	-	25-50	0
21	5/8 11-7/8	NH_4Cl $CaCl_2$	0	48	88	830	0	2	38	57	-	-	-	-	0	0
22	25 25	$ZnCl_2$ $CaCl_2$	4	21	587	347	-	-	-	-	-	-	-	-	0-25	0
23	12-1/2 12-1/2	$ZnCl_2$ $CaCl_2$	5	33	311	566	-	-	-	-	2	13	83	116	0	0
24	6-1/4 6-1/4	$ZnCl_2$ $CaCl_2$	0	1	15	79	-	-	-	-	0	4	21	188	0	0
25	6-1/4 18-3/4	$ZnCl_2$ $CaCl_2$	0	1	8	83	-	-	-	-	0	26	358	816	0	0
26	1-1/4 11-3/4	$ZnCl_2$ $CaCl_2$				not	chec	ked							0	
27	2-1/2 22-1/2	$ZnCl_2$ $CaCl_2$				not	chec	ked							0	
28	3-1/8 9-3/8	$ZnCl_2$ $CaCl_2$				not	chec	ked							0	
29	12-1/2 37-1/2	$ZnCl_2$ $CaCl_2$	21	35	791	285	0	3	9	9	-	-	-	-	0-25	366-p

i = *R. inerme*; p = *R. petiolare*.
Applications made September 6, 1931.
Plots checked August 8-11, 1932.

(CONTINUED)

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[illegible]

[illegible]

Plot No.	Chemicals Applied: Pounds	Chemicals Applied: Chemical	R. petiolare Bushes Dead	R. petiolare Bushes Live	R. petiolare Feet Stem Dead	R. petiolare Feet Stem Live	R. inerme Bushes Dead	R. inerme Bushes Live	R. inerme Feet Stem Dead	R. inerme Feet Stem Live	R. lacustre Bushes Dead	R. lacustre Bushes Live	R. lacustre Feet Stem Dead	R. lacustre Feet Stem Live	Per Cent Brush Kill	Seed-lings
30	5 45	$ZnCl_2$ $CaCl_2$				not	che	cked							0	
31	1-1/4 23-3/4	$ZnCl_2$ $CaCl_2$				not	che	cked							0	
32	5/8 11-7/8	$ZnCl_2$ $CaCl_2$				not	che	cked							0	
33	25	$CaCl_2$				not	che	cked							0	
34	12-1/2	$CaCl_2$				not	che	cked							0	
35	2-1/2 47-1/2	$ZnCl_2$ $CaCl_2$	13	61	569	474	0	2	0	19	-	-	-	-	0-25	221-p
36	25	NH_4Cl				not	che	cked							0	
37	12-1/2	NH_4Cl				not	che	cked							0	
38	25	$ZnCl_2$	26	33	419	161	-	-	-	-	-	-	-	-	0-25	13-p
39	12-1/2 12-1/2	NaOH $CaCl_2$	0	29	155	428	-	-	-	-	-	-	-	-	0-25	[illegible]-p
40	6-1/4 6-1/4	NaOH $CaCl_2$				not	che	cked							0	
41	12-1/2 37-1/2	NaOH $CaCl_2$	0	23	74	480	-	-	-	-	-	-	-	-	0	0
42	25 25	NaOH $CaCl_2$	0	19	118	263	-	-	-	-	-	-	-	-	0	0
43	6-1/4 18-3/4	NaOH $CaCl_2$				not	che	cked							0	
44	3-1/8 9-3/8	NaOH $CaCl_2$				not	che	cked							0	
45	5 45	NaOH $CaCl_2$				not	che	cked							0	
46	1-1/4 11-1/4	NaOH $CaCl_2$				not	che	cked							0	
47	2-1/2 22-1/2	NaOH $CaCl_2$				not	che	cked							0	
48	2-1/2 47-1/2	NaOH $CaCl_2$				not	che	cked							0	
49	1-1/4 23-3/4	NaOH $CaCl_2$				not	che	cked							0	
50	12-1/2	$ZnCl_2$	25	34	2,145	6[illegible]4	-	-	-	-	-	-	-	-	0-25	51-p
51	5/8 11-7/8	NaOH $CaCl_2$				not	che	cked							0	
52	11-1/8 13-7/8	NaOH NaF				not	che	cked							0	
53	5-[illegible]/16 6-15/16	NaOH NaF				not	che	cked							0	
54	1-1/2 1-7/8	NaOH NaF				not	che	cked							0	
55	3 3-3/4	NaOH NaF				not	che	cked							0	
56	3-3/8	NH_4Cl				not	che	cked							0	
57	6-3/4	NH_4Cl				not	che	cked							0	

Plots No. 54-57, chemicals applied in solution (16 gallons per square rod)
i = R. inerme; p = R. petiolare.
Applications made September 6, 1931.
Plots checked August 8-11, 1932.

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3. Results. See Table No. 3. With the exception of plot No. 1, on which 21 pounds of sodium chlorate and 29 pounds of calcium chloride were applied, there was no satisfactory kill. On this particular plot excellent results were obtained. However, equally satisfactory results can be obtained with a smaller amount of sodium chlorate when applied in solution in two successive treatments as shown in other experiments.

C. Seasonal Toxicity of 5 Per Cent, 7-1/2 Per Cent and 10 Per Cent Concentrations by Weight of Atlacide and Sodium Chlorate Sprays.

1. Purpose.

a. To compare the toxicity of Atlacide and sodium chlorate sprays on *R. petiolare*.

b. To compare the toxicity of 5 per cent, 7-1/2 per cent and 10 per cent by weight of Atlacide and sodium chlorate sprays on *R. petiolare*.

c. To test the seasonal toxicity of Atlacide and sodium chlorate sprays on *R. petiolare*.

2. Method. There are two important considerations to be kept in mind concerning this study:

a. The experiment was to test the toxicity of sprays on *R. petiolare*. The method of spraying the aerial portion and crown of Ribes bushes used by regular eradication crews for treatment of *R. petiolare* was followed. Since this treatment alone is not the most successful method of treating *R. inerme* and *R. lacustre*, the results secured on these species are only incidental to the main purpose of the experiment.

b. The experiment was conducted by a regular eradication crew to make it as comparable to average crew work as possible. Although it can not be presumed that there was a uniformity of treatment of all Ribes on the plots, the experiment was sufficiently large to adequately test the effectiveness of the various solutions under conditions representative of regular chemical eradication operations.

3. Results. See Table No. [illegible]

C. [illegible]

1. Purpose.

a. [illegible]

b. [illegible]

c. [illegible]

2. Method. [illegible]

a. [illegible]

b. [illegible]

TABLE NO. 4

SEASONAL TOXICITY OF ATLACIDE AND SODIUM CHLORATE SPRAYS APPLIED TO AERIAL PORTIONS OF RIBES BUSHES

Experimental Plots	Date of Spraying 1931	Acres in Plot	Gals. Spray Per Acre	Results of Check on September 6-10, 1932																	
				R. petiolare						R. inerme						R. lacustre					
				Dead				Alive		Dead				Alive		Dead				Alive	
				Bushes		Stem				Bushes		Stem				Bushes		Stem			
				No.	Per Cent	Feet	Per Cent	No. Bu.	Feet Stem	No.	Per Cent	Feet	Per Cent	No. Bu.	Feet Stem	No.	Per Cent	Feet	Per Cent	No. Bu.	Feet Stem
5% Atlacide	6/10-15	3.7	124	89	92	11,350	98	8	200	327	78	23,505	93	94	419	165	51	13,310	94	157	151
7½% Atlacide	6/16-19	1.0	140	175	89	3,508	85	15	603	0	0	65	61	2	42	32	80	424	93	3	32
10% Atlacide	6/20-7/2	1.5	223	55	98	3,253	99	2	3	-	-	-	-	-	-	72	64	3,759	93	40	157
5% $NaClO_3$	7/3-6	1.7	158	17	81	1,100	99	4	7	20	87	320	98	3	19	124	45	11,400	93	152	836
7½% $NaClO_3$	7/7-11	2.0	173	44	85	4,865	99	3	22	11	14	3,400	75	70	378	110	49	9,077	96	115	373
10% $NaClO_3$	7/11-24	0.8	188	110	93	14,205	98	8	244	1	33	85	95	2	4	2	5	908	75	38	281
5% Atlacide	7/24-8/7	1.6	91	160	32	7,358	94	150	485	0	0	15	23	7	50	115	26	7,720	67	333	3,734
10% Atlacide	8/8-11	1.3	144	191	92	15,628	99	17	284	1	33	346	46	2	405	4	12	715	78	30	203
5% $NaClO_3$	8/12	1.0	110	60	31	5,677	95	36	277	-	-	-	-	-	-	4	4	1,718	58	95	1,233
10% $NaClO_3$	8/13-16	2.0	143	106	35	5,344	99	6	54	-	-	-	-	-	-	54	39	2,946	77	84	888
5% $NaClO_3$	8/17-31	5.9	124	104	84	5,491	99	20	74	0	0	3	16	1	16	56	26	12,800	91	165	5,001
10% $NaClO_3$	8/17-31	2.8	154	86	100	3,663	100	0	0	-	-	-	-	-	-	90	43	10,160	89	118	1,417

TABLE NO. 5

ARITHMETIC AVERAGES OF THE PERCENTAGES OF DEAD RIBES BUSHES AND STEM ON THE EXPERIMENTAL PLOTS LISTED IN TABLE NO. 4, GROUPED ACCORDING TO KIND OF SPRAY, CONCENTRATION OF SPRAY, AND TIME OF SPRAYING

Experimental Plots	Acres in Plots	Gallons Per Acre	Pounds Chemical Per Acre	Per Cent Dead: R. petiolare Bushes	R. petiolare Stem	R. inerme Bu.	R. inerme Stem	R. lacustre Bu.	R. lacustre Stem
Atlacide	3.6	140	144	85	95	38	57	47	85
$NaClO_3$	16.2	142	103	84	96	34	71	30	81
5% Solutions	13.9	132	69	72	97	41	59	30	73
7-1/2% Solutions	3.0	155	135	96	92	7	67	65	94
10% Solutions	8.9	164	101	95	99	33	71	33	90
Sprayed June 10, July 2	8.2	156	150	93	94	33	80	65	92
Sprayed July 3, July 24	4.5	135	118	86	99	45	82	33	83
Sprayed July 25 August 31	15.1	133	106	79	98	11	28	35	75

3. Results. See Tables No. 4 and 5.

a. Atlacide and sodium chlorate were equally effective when Atlacide was used in amounts which provided approximately the same sodium chlorate content in the Atlacide sprays as in the corresponding sodium chlorate sprays. In these sprays 1.4 pounds of Atlacide were used to 1 pound of sodium chlorate. In achieving approximately the same degree of kill, 40 per cent more Atlacide was used than sodium chlorate.

b. The 10 per cent solutions killed 23 per cent more of the total R. petiolare bushes and 2 per cent more of the stem on the plots than the 5 per cent solutions.

c. Spraying performed in June with the three different concentrations of spray killed 7 per cent more of the total R. petiolare bushes on the plots than spraying done in July, and 14 per cent more than spraying done in August, although the June spraying killed 4 per cent less of the stem. However, attention is called to the excellent results secured with a 10 per cent solution of sodium chlorate on 3 different plots sprayed in August.

On the basis of these results, it is recommended that a 10 per cent solution of sodium chlorate be used on all knapsack spraying operations for

the killing of R. petiolare, and that all spraying be completed as soon as it is conveniently possible after the start of the spraying season. Excellent results can be secured from careful spraying in August. A thorough saturation of all leaves and stems and an application of spray to the base of the bush where it enters the ground appears to be the most satisfactory method of treating R. petiolare.

D. Successive Treatments with Sodium Chlorate and Atlacide in Aerial and Soil Applications.

1. Purpose.

a. To find a practical method of destroying all Ribes species, R. inerme in particular, with chemicals.

b. To test the effectiveness of successive treatments with chemical.

2. Method. Refer to pp. 102-107, 1931 Annual Report.

In general the first treatment consisted in spraying the aerial portion of the Ribes to the point of dripping and spraying the ground representing the root distribution of the Ribes until puddles began to form. The second treatments varied according to plots. These variations will be discussed along with a consideration of results.

3. Results. See Table No. 6. It was possible to make a 100 per cent check on plots Nos. 1 and 2. In making the check, the actual size of the treated area was recorded. This showed that on the area recorded as worked, approximately 50 per cent of the ground was actually treated with chemical.

A higher per cent kill of R. inerme was obtained on Plot No. 1 than on No. 2. The treatment of these plots differed in the method of applying the second dose of chemical. On No. 1, the roots of all R. inerme and R. lacustre were heavily drenched whether they appeared to be alive or dead and the aerial portion of any releafing or resprouting Ribes was sprayed. On No. 2 the treatment was the same except that the aerial portions of releafing or resprouting R. inerme and R. lacustre were not sprayed. On these species only root treatment was given.

Because of the relatively poor results on plots Nos. 3 to 5 a complete check would have been very difficult and of little value. Less than 50 per cent of the R. inerme and R. lacustre bushes were killed. The variations in the treatment of these plots from those on Nos. 1 and 2 which probably contributed to these results were: less chemical was applied; area was sprayed later in season; insufficient time elapsed between first and second treatments to permit much resprouting; and only resprouting Ribes were sprayed the second time.

the killing of R. [illegible], and that all spraying be completed as soon as is conveniently possible after the start of the spraying season. Excellent results can be secured from careful spraying in August. A thorough saturation of all leaves and stems and an application of spray to the base of the bush where it enters the ground appears to be the most satisfactory method of treating R. [illegible].

4. Successive Treatments with [illegible] and [illegible] Soil Applications.

1. Object.

a. To find a practical method of destroying all [illegible] species, R. [illegible] in particular, with chemicals.

b. [illegible]

c. [illegible]

In general the first treatment consisted in spraying the aerial portion of the [illegible] to the point of dripping and soaking the ground representing the root distribution of the [illegible] until moisture began to form. The second treatments varied according to plots. These variations will be discussed along with a consideration of results.

3. Results. See Table No. 6. It was possible to make a 100 per cent check on plots Nos. 1 and 2. In making the check, the actual area of the treated area was recorded. This showed that on the area recorded as treated, approximately 50 per cent of the ground was actually treated with chemicals.

A higher per cent kill of R. [illegible] was obtained on Plot No. 1 than on No. 2. The treatment of these plots differed in the method of applying the second dose of chemicals. On No. 1, the roots of all R. [illegible] and R. [illegible] were heavily drenched whether they appeared to be alive or dead and the aerial portion of any [illegible] or resprouting [illegible] was sprayed. On No. 2 the treatment was the same except that the aerial portions of [illegible] or resprouting R. [illegible] and R. [illegible] were not sprayed. On these species only [illegible].

Because of the relatively poor results on plots Nos. 3 to 5 a complete check would have been very difficult and of little value. [illegible] 50 per cent of the R. [illegible] and R. [illegible] plants were killed. The variations in the treatment of these plots from those on Nos. 1 and 2 which probably contributed to these results were: less chemical was applied; area was sprayed later in season; insufficient time elapsed between first and second treatments to permit much resprouting and only resprouting [illegible] were sprayed the second time.

The kill on plots Nos. 1 and 2 was heavy on Ribes and brush. The area was opened up sufficiently to permit the eradication of the remaining Ribes by hand pulling methods requiring less than a man day per acre. On the other plots, an additional chemical treatment is necessary before the area will be ready for clean-up work by hand.

It is estimated from the results of this study, that heavy R. inerme areas can be properly worked at an average cost of $40.00 to $50.00 per acre.

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It is estimated from the results of this study, that heavy Ribes areas can be properly worked at an average cost of $40.00 to $50.00 per acre.

TABLE NO. 6

EFFECTIVENESS OF SUCCESSIVE APPLICATIONS OF SODIUM CHLORATE AND ATLACIDE SPRAYS TO AERIAL PORTIONS OF RIBES AND TO THE SOIL

Plot No.	Acres in Plot	Pounds Chemical Per Acre	R. petiolare Dead Bushes No.	R. petiolare Dead Bushes Per Cent	R. petiolare Dead Stem Feet	R. petiolare Dead Stem Per Cent	R. petiolare Alive No. Bu.	R. petiolare Alive Feet of Stem	R. inerme Dead Bushes No.	R. inerme Dead Bushes Per Cent	R. inerme Dead Stem Feet	R. inerme Dead Stem Per Cent	R. inerme Alive No. Bu.	R. inerme Alive Feet of Stem	R. lacustre Dead Bushes No.	R. lacustre Dead Bushes Per Cent	R. lacustre Dead Stem Feet	R. lacustre Dead Stem Per Cent	R. lacustre Alive No. Bu.	R. lacustre Alive Feet of Stem
1	5.5	377	1,469	99.9	100,435	99.9	2	14	553	67	98,412	98	263	1,832	72	61	2,849	95	45	151
2	6.1	385	759	97.6	63,034	99.9	19	73	601	60	37,591	97	394	2,403	-	-	-	-	-	-
3	5.7	136						75						3,553						705
4	3.0	190						870						3,350						1,050
5	3.0	92						870						1,300						300
6	2.9	92						450						4,400						1,430

See Table No. 5, p. 104 in 1931 Annual Report for detailed account of treatments.

Plots treated in 1931, checked August, 1932.

E. Atlacide Applied in Form of Dust

1. Purpose.

   a. To test the toxicity of Atlacide on R. petiolare, R. inerme and R. lacustre when applied in the form of dust to the bushes and soil.

2. Method. This experiment was performed on a small scale late in August 1931 with a dusting machine purchased from the Chipman Chemical Engineering Company. Considerable difficulty was experienced with the machine which resulted in an uneven distribution of Atlacide over the area. Also more time and labor was required than should be necessary. In so far as possible a fine layer of Atlacide dust was spread over all the Ribes and the soil beneath them.

3. Results. See Table No. 7. The uneven distribution of chemical resulted in a very uneven kill over the plot. Presumably where the greatest kill took place was where the heavy applications of Atlacide dust were made.

This method of application does not compare favorably with the standard spraying methods used by regular eradication crews. Although a more suitable dusting machine would probably reduce the amount of labor required and give a more even distribution of chemical, it can hardly be expected that a sufficient saving could be made to make the method practical. Since the amounts of chemical used failed to kill a sufficiently high per cent of the Ribes, a larger amount would probably be necessary to obtain satisfactory results.

TABLE NO. 7

RESULTS OF APPLICATION OF ATLACIDE
IN FORM OF DUST ON RIBES

R. petiolare						R. inerme						R. lacustre					
Dead				Alive		Dead				Alive		Dead				Alive	
Bushes		Stem		No. Bush-es	Feet of Stem	Bushes		Stem		No. Bush-es	Feet of Stem	Bushes		Stem		No. Bush-es	Feet of Stem
No.	%	Feet	%			No.	%	Feet	%			No.	%	Ft.	%		
673	[illegible]	6,317	96	30	275	0	0	1,365	7	168	17,632	3	100	180	100	0	0

Chemical applied August, 1931. Area checked September 10, 1932.
Size of plot - 1/2 acre.
Cost of work - $65.00 per acre, 430 lbs. Atlacide per acre, 4.4 man days per acre.

4. Atlacide Applied in Form of Dust

1. Purpose.

a. To test the toxicity of Atlacide on R. petiolare, R. inerme and R. lacustre when applied in the form of dust to the bushes and soil.

2. Method. This experiment was performed on a small scale late in August 1941 with a dusting machine purchased from the Chipman Chemical Engineering Company. Considerable difficulty was experienced with the machine which resulted in an uneven distribution of Atlacide over the area. Also more time and labor was required than would be warranted. As far as possible a fine layer of Atlacide dust was spread over all the Ribes and the soil beneath them.

3. Results. See Table No. 7. The uneven distribution of chemical resulted in a very uneven kill over the plot. Invariably where the greatest kill took place was where the heavy applications of Atlacide dust were made.

This method of application does not compare favorably with the standard spraying methods used by regular eradication crews. Although a more suitable dusting machine would probably reduce the amount of labor required and give a more even distribution of chemical, it can hardly be expected that a sufficient saving could be made to make the method practical. Since the amounts of chemical used failed to kill a sufficiently high percent of the Ribes, a larger amount would probably be necessary to obtain satisfactory results.

TABLE NO. 7

RESULTS OF APPLICATION OF ATLACIDE
IN FORM OF DUST ON RIBES

R. petiolare						R. inerme						R. lacustre					
Dead				Alive		Dead				Alive		Dead				Alive	
Bushes		Stem		No. Bush-es	Feet of Stem	Bushes		Stem		No. Bush-es	Feet of Stem	Bushes		Stem		No. Bush-es	Feet of Stem
No.	%	Feet	%			No.	%	Feet	%			No.	%	Ft.	%		
273	94	6,317	76	39	375	[illegible]	[illegible]	1,466	7	100	[illegible]	3	[illegible]	[illegible]	100	[illegible]	[illegible]

Chemical applied August, 1941. Area checked September 30, 1941.
Size of plot — 1/2 acre.
Cost of work — $12.00 per acre. 450 lbs. Atlacide per acre, 4.8 man days per acre.

F. Stem, Root and Crown Injections.

A total of 166 bushes on 2.4 acres were injected with a copper complex paste during June and July, 1931. Approximately 3,300 injections were made and 4 gallons of paste used. Actual time spent finding the Ribes bushes and crowns and making the injections was 17-1/2 man days.

This study is more fully described on pages 100-101 in the 1931 Annual Report. The final check on the area in September, 1933 showed the following results:

89 _R. inerme_ bushes treated. 1 bush killed.
9,287 feet of _R. inerme_ stem treated. 3,365 feet killed.
77 _R. petiolare_ bushes treated. 11 bushes killed.
1,302 feet of _R. petiolare_ stem treated. 1,183 feet killed.

This method is ineffective as far as this particular paste is concerned. Any method requiring root and crown injections involves a great amount of labor, principally for locating the roots and crowns.

G. Salt ($NaCl$) Applications to Soil.

1. Purpose.

   a. To test common crystalline salt ($NaCl$) as a means of Ribes suppression in stream type.

   b. To test salt as a means for entirely destroying plant life on stream type areas.

2. Method. See Page 99, 1931 Annual Report.

3. Results. See Table No. 5. While the application of salt as made in this experiment is not a practical method of Ribes suppression, some of the treatments demonstrate a possibility for entirely destroying plant life on an area. The results show that:

   a. 7 tons of common salt per acre were not sufficient to satisfactorily suppress the Ribes on the plot.

   b. Practically no kill was secured with an application of 1 ton of salt per acre.

   c. Common salt is more effective on other brush species than on Ribes.

d. The selective method of applying salt to the crowns of Ribes is not as effective as a broadcast distribution of the same amount of salt over the entire plot. Where this selective method was used the amount of kill on other brush species was slight since the salt was applied only to the Ribes crowns.

e. The salt was more effective in killing _R. inerme_ than _R. petiolare_.

TABLE NO. 8

RESULTS OF SALT APPLICATIONS TO SOIL

Plot	Acres in Plot	Pounds of Salt Per Acre	Form in Which Applied	Method of Application	R. petiolare Dead Bushes No.	R. petiolare Dead Bushes Per Cent	R. petiolare Dead Stem Feet	R. petiolare Dead Stem Per Cent	R. petiolare Alive No. Bu.	R. petiolare Alive Feet of Stem	R. inerme Dead Bushes No.	R. inerme Dead Bushes Per Cent	R. inerme Dead Stem Feet	R. inerme Dead Stem Per Cent	R. inerme Alive No. Bu.	R. inerme Alive Feet of Stem	Approximate Kill on Other Brush Species	Approximate Cost Per Acre
1	0.2	9,500	Dry	By Hand to Ribes Crowns	60	28	7,990	71	168	3,245	146	41	3,040	84	212	1,551	20%	$191
2	0.6	14,000	Dry	Broadcast by Hand	52	72	6,255	98	20	129	410	83	22,780	95	90	1,085	100%	$281
3	0.35	2,100	Solution	Broadcast by Power	Very little effect on Ribes and other brush.													$42
4	0.7	9,700	Solution	do	120	44	12,250	94	152	737	256	68	20,565	97	118	630	90%	$195

Salt applied July 8 to August 4, [illegible].
Plots checked September 6-10, [illegible].

W. 946. Selective application of crystal common salt to crowns of R. lacustre and R. petiolare. July 14, 1931.

W. 946-2. Dead R. lacustre and R. petiolare one year later. July 14, 1932.

W. 1102. One year after broadcast application of crystal common salt at rate of 7 tons per acre.

II. Results of 1932 Work

A. Aerial Spraying and Soil Drenches with Sodium Chlorate and Ammonium Thiocyanate.

1. Purpose. To test the toxicity of sodium chlorate and ammonium thiocyanate in solution.

a. As influenced by the time of season.

b. When applied as aerial spray and soil drench.

c. When applied as soil drench only.

d. When applied in different amounts and in different volumes of water.

e. When applied in two treatments.

2. Method. These tests were conducted on plots 2 and 4 square rods in size. Treatments were made with knapsack spray outfits.

TABLE NO. 9

AMOUNTS OF SODIUM CHLORATE AND AMMONIUM THIOCYANATE, USED IN EACH VOLUME OF WATER APPLIED

Amount of Chemical Per Square Rod	2 Pounds	4 Pounds	8 Pounds
Number of	4	4	4
Gallons of	8	8	8
Water Per	16	16	16
Square Rod	32	32	32

Each test included the treatment of 24 plots. On 12 plots the treatments were made to the soil only and on the other 12 plots the aerial parts of all brush to the height of the Ribes were saturated and the remainder of the solution was distributed uniformly over the ground. Table No. 9 shows the schedule of twelve treatments with the amount of chemical used in each volume of water.

The following sets of plots were established:

Sodium chlorate

a. 24 - 4-square rod plots, treated June 25-July 6, 1932. One-half of each plot resprayed at the rate of 2 pounds chemical in 4 gallons of water per square rod.

b. 24 - 2-square rod plots, treated July 21, 1932. One-half of each plot resprayed August 20 at the rate of 8 pounds chemical in 8 gallons of water per square rod.

c. 24 - 2-square rod plots, treated July 27, 1932. One-half of each plot resprayed August 24 at the rate of 4 pounds of chemical in 8 gallons of water per square rod.

d. 24 - 3-square rod plots, treated August 30, 1932. On this set 12 plots were given the aerial and soil treatments combined. On the other 12 plots the same method of application was used, except that 1/2 of the amount of solution was applied on one day and the other 1/2 was applied the following day.

Ammonium thiocyanate

a. 24 - 2-square rod plots, treated June 20-24, 1932. One-half of each plot resprayed August 31 at the rate of 4 pounds of chemical in 3 gallons water per square rod.

b. 24 - 2-square rod plots, treated July 7-19, 1932. One-half of each plot resprayed August 31 at the rate of 8 pounds chemical in 4 gallons water per square rod.

c. 24 - 3-square rod plots, treated August 2, 1932. One-half of each plot resprayed at the rate of 4 pounds chemical in 8 gallons water per square rod.

3. Results. An estimate or check of the effectiveness of these treatments made during the current season is of little value. However, observations made in October as to the condition of the Ribes show that some of the treatments were proving very effective.

In general, the treatments with sodium chlorate calling for the spraying of the brush and drenching the ground were apparently more effective. Results on the portion of the plots receiving one treatment were uncertain. Excellent kills were showing up on practically all the parts which were resprayed. On those areas originally treated with 4 to 8 pounds of chemical per square rod and later resprayed between 80 per cent and 100 per cent of the R. inerme was apparently dead.

[illegible]

a. 4? - 8-square rod plots, treated June [illegible] half of each plot received at the rate of 2 pounds [illegible] water per square rod.

b. 24 - 8-square rod plots, treated July [illegible] each plot received August 21 at the rate of 2 pounds [illegible] of water per square rod.

c. 24 - 8-square rod plots, treated [illegible] each plot received August 21 at the rate of 4 pounds of [illegible] gallons of water per square rod.

[illegible] 12 plots were given the spray [illegible] 12 plots the same [illegible] amount of solution was applied [illegible] following day.

[illegible]

a. 24 - 8-square rod plots, treated [illegible] each plot received [illegible] at the rate of [illegible]

b. 24 - 8-square rod plots, treated July [illegible] each plot received August 31 at the rate of [illegible] pounds [illegible] water per square rod.

c. 24 - 8-square rod plots, treated [illegible] each plot received at the rate of [illegible]

5. Results. An estimate [illegible] observations made in October as to the condition [illegible] of the treatments were [illegible]

In general, the treatments [illegible] spraying of the crops and [illegible] results on the portion of the plots receiving [illegible] excellent while [illegible] were showing up on practically all [illegible] which were sprayed. On those areas [illegible] per square rod and later [illegible] the S. [illegible] were apparently dead.

In regard to the ammonium thiocyanate, those plots given a soil drench only were showing more satisfactory results than those given aerial and soil treatments combined. The resprayed portions of the plots were showing excellent results. The killing effect of the ammonium thiocyanate seems to be entirely through the roots. The action is more rapid than in the case of sodium chlorate and consequently in some cases the two chemicals were showing equally good results. Through the entire schedule of treatments it seemed that for each pound of chemical used that sodium chlorate was slightly more effective than ammonium thiocyanate on R. inerme and R. lacustre. As stated under another experiment in this report, ammonium thiocyanate is not practical for use on R. petiolare.

From present indications a plan calling for two applications of chemical with a sufficient period of time between to permit resprouting, involving a total of 6 to 12 pounds of chemical per square rod, will be satisfactory for killing R. inerme. The proper coordination between the two treatments will reduce the Ribes live stem and bushes on an area sufficiently to permit a very efficient clean-up job by hand pulling methods.

In regard to the ammonium thiocyanate, [illegible] drench only were showing more satisfactory results [illegible] and soil treatments combined. The sprayed portions of the plots [illegible] showing excellent results. The killing effect of the [illegible] seems to be entirely through the roots. [illegible] in the case of sodium chlorate and [illegible] chemicals were showing equally good results. [illegible] of treatments it seemed that for each pound of chemical used that sodium chlorate was slightly more effective than [illegible] and E. *lucida*. As stated under another experiment [illegible] ium thiocyanate is not practical for use on E. [illegible].

From present indications a plan calling for two applications of chemical with a sufficient period of time between [illegible] involving a total of 8 to 12 pounds of chemical per square rod, will be satisfactory for killing E. [illegible]. The proper coordination [illegible] treatments will reduce the [illegible] to permit a very efficient clean-up job by hand pulling [illegible].

W. 1104. Before treatment. Sodium chlorate applied as aerial spray and soil drench at rate of 1,280 pounds in 2,560 gallons of water per acre. July 19, 1932.

W. 1104-1. Seven weeks after treatment. September 2, 1932.

B. Ammonium Thiocyanate Applications in Dry Form to the Soil.

A small test was made with ammonium thiocyanate applied to the soil in dry form. Four plots, one rod square, were treated with 4 pounds, 8 pounds, 16 pounds, and 32 pounds of chemical.

The last inspections made on the plots showed that a good kill may result from the 16 and 32-pound applications. It is highly probable that the heavier applications may be very effective but as in the case of sodium chlorate better results for the amount of chemical used are obtained when it is applied in solution.

C. Individual Bush Study Involving the Use of Different Volumes and Concentrations of Sodium Chlorate Applied to Aerial and Root Systems of Ribes.

1. Purpose. This experiment is to study the best utilization of chemical on R. inerme and in so far as possible to provide some basis upon which to describe how heavily a bush should be sprayed.

2. Method. An experiment similar to this was performed in 1931 but on account of the improper method of establishing the plots it was impossible to make a check on the individual bushes. During 1932, each bush was staked individually and any Ribes on the area not identified as individual bushes were treated at the same time. It is hoped that this will make it possible to identify definitely during the following season each individual bush that was specially treated.

The treatments used are similar to those set up in Table No. 9 on page 109 of the 1931 annual report. The treatments are based on the amount of solution required to spray bushes to the point of dripping and to spray the soil to the point of formation of puddles on the ground. The concentration of chemical is varied in these treatments.

3. Results. One hundred and fifty R. inerme bushes were treated between August 3 and August 13. No check was made during the 1932 season.

D. Extensive Work with Sodium Chlorate and Ammonium Thiocyanate.

1. Purpose. In conjunction with the controlled plot studies, crews were engaged in treating all Ribes species with either sodium chlorate or ammonium thiocyanate. The purpose was to use some of the most promising methods for killing Ribes and to determine the cost and efficiency of such work.

2. Method. The methods of application were of two general types.

a. Selective, in which only the Ribes and the ground covering their roots were sprayed. The power set-up used in former years with 4 to 5 men on nozzles was used.

B. Ammonium Thiocyanate Applications in Dry Form to the Soil.

A small test was made with ammonium thiocyanate applied to the soil in dry form. Four plots, one rod square, were treated with 4 pounds, 8 pounds, 16 pounds, and 32 pounds of chemical.

The last inspections made on the plots showed that a good kill may result from [illegible] applications. [illegible] the heavier applications may be very effective but as in the case of sodium chlorate better results for the amount of chemical [illegible] is applied in solution.

C. Individual Bush Study Involving the Use of [illegible] trations of Sodium Chlorate Applied to [illegible]

1. Purpose. This experiment is to study the best utilization of chemical on R. inerme and [illegible] which to describe how heavily a bush should be sprayed.

2. Method. An experiment similar to this was performed in [illegible] account of the improper method of establishing the plots it was impossible to make a check on the individual bushes. [illegible] was specially treated.

The treatments used are similar to those set up in Table No. 9 on page [illegible] of the 1931 annual report. [illegible] of solution required to spray bushes to the point of dripping and to spray the soil to the point of formation of puddles on the ground. The concentration of chemical is varied in these treatments.

3. Results. One hundred and fifty R. inerme bushes were treated between August 3 and August 13. No check was made during the 1932 season.

D. [illegible]

1. Purpose. In conjunction with [illegible] engaged in treating all Ribes species with either sodium chlorate or ammonium thiocyanate. The purpose was to use some of the most promising methods for killing Ribes and to determine the cost and efficiency of such work.

2. Method. The methods of application were of two general types.

a. Selective, in which only the Ribes and the ground covering their roots were sprayed. The power set-up used in former years with 4 to 5 men on nozzles was used.

b. <u>Broadcast</u>, in which the entire area was sprayed, except where there were obviously no Ribes. A special power set-up was used for this work which is described in the report "Development of Ribes Eradication Equipment". Two types of nozzles also described in this report were tested. A special Rams Horn nozzle was used on plots J, K, L and M.

The concentrations of chemical and volumes of water were varied on the different plots. Parts of certain plots were resprayed to obtain a better kill.

3. <u>Results</u>. See Table No. 10. The accompanying map of the plots shows the treatments given each area and the time required. Plots A and B were sprayed first by regular Forest Service crews in 1931 with a 5 per cent solution of sodium chlorate and were resprayed in 1932. Sufficient action has taken place to show some very excellent results. A clean-up of the remaining Ribes on the area can be done at a cost of $3 or $4 per acre. The root systems of the surviving Ribes were severely injured. In this damaged condition they are very easily pulled.

The treatment on Plot E, with an original spray of sodium chlorate followed by a respray with ammonium thiocyanate, regardless of the interval between, can not be used without creating a very severe fire hazard. It was learned on this plot, as well as on others where sodium chlorate and ammonium thiocyanate came in contact with each other, that spontaneous fires were certain to start where the sun's rays fell on the area.

On the plots which were not checked, it was difficult to forecast what might finally take place. It was observed that in the case of the heavy drenches severe root injury had taken place as deep as 12 and 15 inches, while the crowns of the same Ribes were still in a relatively hardy condition.

With the wide variety of treatments and resprays, some indications may be had as to the most economical and efficient use of chemical in the first and second treatments.

On a tributary creek of the Orogrande special extensive work was done with ammonium thiocyanate on <u>R. petiolare</u>. The amount of ammonium thiocyanate solution applied was greatly in excess of the amount of sodium chlorate which would be required to kill all the <u>R. petiolare</u>. Indications at the close of the season were that even the heaviest concentrations of ammonium thiocyanate would not kill a sufficiently great amount of the <u>R. petiolare</u> to make its use practical. It was more effective on <u>R. inerme</u> and <u>R. lacustre</u> than on <u>R. petiolare</u>. The results of this test are shown in Table No. 11.

6. Prospect. In which the entire area was sprayed, [illegible] there were obviously no Ribes. A special power setup [illegible] the work which is described in the report "Development of [illegible] equipment". Two types of nozzles also described in this report [illegible]. A special [illegible] horn nozzle was used on plots 4, 5, 6 and [illegible].

The compositions of chemical and volumes of spray [illegible] tested on the different plots. Parts of certain plots were [illegible] to obtain a [illegible].

7. Results. See Table No. 10. The accompanying map of the plots [illegible] the treatments given each area and the time required. Plots [illegible] and [illegible] were sprayed first by regular Forest Service crews in 1951 with a 5 per cent solution of [illegible] [illegible] which [illegible] has taken place to show some very excellent results. [illegible] remaining Ribes on the area can be done at a cost of [illegible] or [illegible] per acre. [illegible] root systems of the surviving Ribes were severely injured. [illegible] condition they are very easily pulled.

The treatment on Plot 5, [illegible] spray [illegible] followed by a re-spray with ammonium thiocyanate, regardless [illegible] between, can not be used without [illegible] [illegible] [illegible]. It was learned on this plot, as well as on others where sodium chlorate and ammonium thiocyanate were [illegible] with each other, that spontaneous fires were certain to start where the sun's rays fell on the area.

On the plots which were not checked, it was difficult to forecast what might finally take place. It was observed that in the case of [illegible] branches severe root injury had taken place as deep as 12 and 15 inches, while the crowns of the same Ribes were still in a relatively [illegible] condition.

With the wide variety of treatments and mixtures, some [illegible] may be had as to the most economical and efficient use of chemicals in the first and second treatments.

In a [illegible] creek of the [illegible] [illegible] [illegible] was done with ammonium thiocyanate on R. [illegible]. The [illegible] of ammonium sulfamate [illegible] [illegible] chlorate which would be required to kill all the R. [illegible]. [illegible] at the close of the season were that even the heaviest concentrations of ammonium thiocyanate would not kill a sufficiently great amount of the R. petiolare to make its use practical. It was more effective on R. [illegible] and R. inerme than on R. petiolare. The results of this work are shown in Table No. 11.

CHEMICAL ERADICATION METHODS PLOTS

TABLE NO. 10

RESULTS OF EXTENSIVE WORK ON 1932 AREAS AS INDICATED BY A PRELIMINARY CHECK

Plot	Acres	Date Sprayed	Date Resprayed	Condition of Ribes Stem as Indicated by Sample Check, Sept. 10-12, 1932								
				Per Cent R. inerme Stem			Per Cent R. lacustre Stem			Per Cent R. petiolare Stem		
				Dead	Questionable	Alive	Dead	Questionable	Alive	Dead	Questionable	Alive
A	13.0	Aug. 1931	July 1-3	70.5	22.4	7.1	94.4	4.4	1.2	100	0	0
B	3.5	Aug. 1931	July 8-23	57.7	33.7	13.6	75.4	21.1	3.5	99	-	1.0
C	32.4	July 26 Sept. 6	-	31.6	61.8	6.7	-	-	-	-	-	-
D	5.7	June 27 July 14	Sept. 6-11				not	checked				
E	2.1	June 27 July 14	Sept. 13				not	checked				
F	3.5	June 27 July 14	-				not	checked				
G	2.0	July 15-19	-	43.3	46.2	10.5	-	-	-	-	-	-
H	1.1	July 20-23	-	36.7	42.9	20.4	-	-	-	-	-	-
I	11.0	Aug. 13-27	-	16.0	75.6	8.4	-	-	-	-	-	-
J	1.0	Sept. 5	-				not	checked				
K	0.3	Sept. 3	Sept. 3				not	checked				
L	2.2	Aug. 17 Sept. 4	-				not	checked				
M	4.5	Sept. 1-3	-				not	checked				

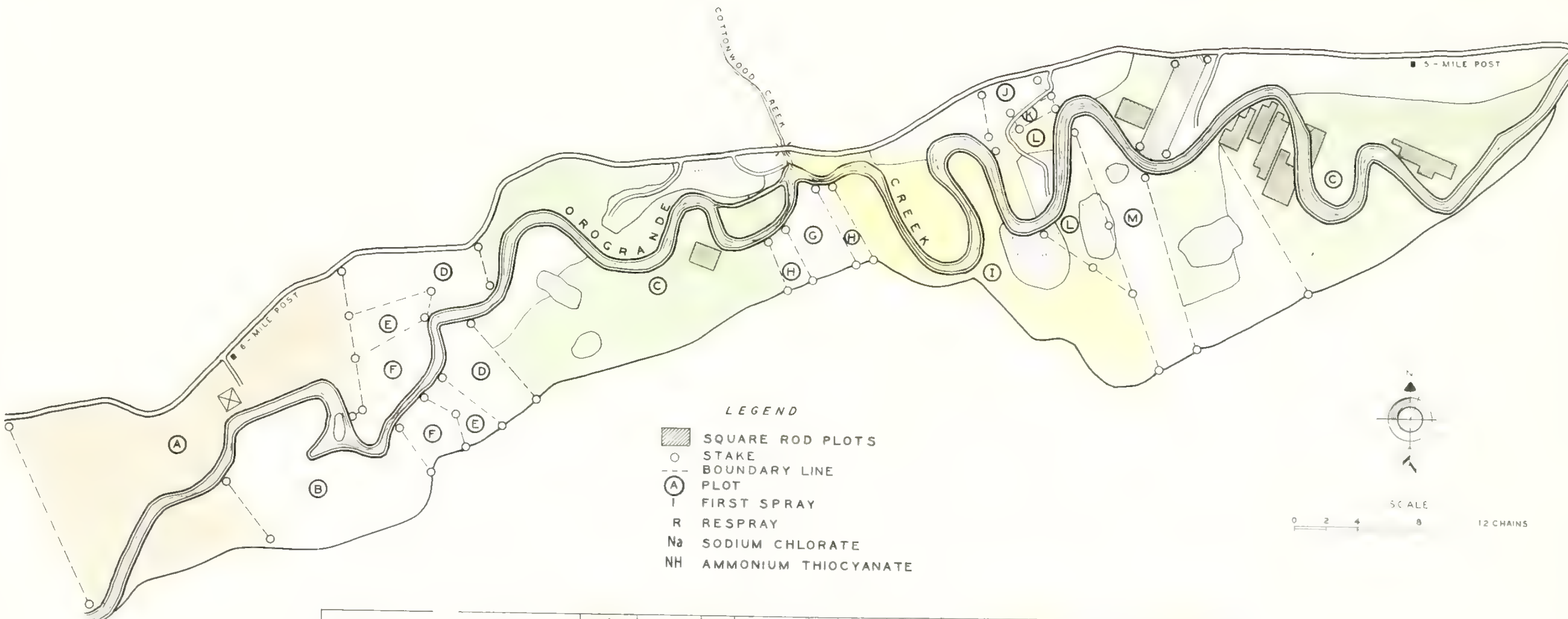
Applications made in 1932, with the exception of first applications on plots A and B.
Location and treatment of plots shown on map 'Chemical Eradication Methods Plots'.

CHEMICAL ERADICATION METHODS PLOTS

CLEARWATER NATIONAL FOREST

OROGRANDE CREEK

1932



PLOT	A		B		C	D		E		F	G	H	I	J	K		L	M
	I	R	I	R	I	I	R	I	R	I	I	I	I	I	I	R	I	I
NUMBER OF ACRES TREATED	19	19	8.5	8.5	32.4	5.7	5.7	2.1	2.1	3.5	2	1.1	11	1	.3	.3	2.2	4.5
CHEMICAL	Na	Na	Na	NH	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na	Na
CONCENTRATION	5%	10%	5%	10%	10%	1 25%	1 25%	1 25%	2 50%	1 25%	1 25%	1 25%	2 50%	10%	2 50%	10%	2 50%	5%
POUNDS OF CHEMICAL PER ACRE	100	118	100	56	493	341	216	341	345	341	785	1020	735	571	311	571	311	357
GALLONS OF SOLUTION PER ACRE	201	118	201	56	493	2727	1727	2727	1379	2727	6277	8162	2939	571	1243	571	1243	713
MAN DAYS PER ACRE	4	2 8	4	2	4 4	3	2 9	3	1 3	3	6	7 2	3 4	2 3	4 3	2 3	4 1	2
APPLICATION	SELECTIVE					BROADCAST												

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H. E. SWANSON

DIVISION OF BLISTER RUST CONTROL
DRAWN BY JOHN F BREAKEY
DECEMBER 1932

TABLE NO. 11

AMMONIUM THIOCYANATE EXPERIMENT ON R. PETIOLARE PERFORMED BY REGULAR ERADICATION CREW

Plot	Date of Spraying	Acres in Plot	Concentration of Spray	Man Days Per Acre	Gallons of Spray Per Acre	Pounds Chemical Per Acre	Approximate Kill on R. petiolare
1	June 23-25	0.5	5%	16	540	270	45%
2	June 27, July 8	0.7	10%	17	357	357	75%
3	July 9-16	1.2	15%	10	467	700	80%
4	Aug. 1-5	0.6	10%	15	836	836	-
5	Aug. 5-10	1.1	15%	3	456	682	-

Note: A very high percentage of the area was covered with R. petiolare.

CONCLUSION

The results of each experiment have been discussed in the body of the report. However there are certain recommendations which can be made for future control work and future experimental work with chemical.

A. Recommendations for Future Control Work.

1. Spraying R. petiolare. The method of treating R. petiolare tentatively set forth in the report for 1931 and followed during 1932 on the control operations is now established by the final results on experimental plots and by the experience of Ribes eradication forces. The method is:

  a. 10% concentration of sodium chlorate.
  b. Thorough saturation with spray of all leaves and stems until they drip.
  c. Application of spray to the base or crown of the Ribes where it enters the ground.

2. Treatment of R. inerme and R. lacustre. On the basis of present information the following method of killing R. inerme and R. lacustre in place is recommended as the most satisfactory:

a. An application of a 5% solution of sodium chlorate to all the leaves and stems of the Ribes to the point of dripping and an application of the same solution to the soil representing the root distribution of the Ribes until puddles begin to form on the ground. This will require approximately 16 gallons of a 5% solution (8 lbs. of $NaClO_3$) per square rod for area actually treated.

b. A second treatment with a 10% solution of sodium chlorate applied after a period of 30 to 60 days or of sufficient duration to permit the resprouting of Ribes. Or in case of areas originally sprayed in August, the second treatment to be made the following season. This second treatment to be applied heavily to the aerial parts of resprouting or releafing Ribes and their roots and in the case of respraying during the current season to be applied to all *R. inerme* and *R. lacustre* whether resprouting or dormant. This will require approximately 4 gallons of solution containing 4 pounds of sodium chlorate per square rod.

B. Recommendations for Future Experimental Work.

Present information on the experiments performed by the chemical eradication methods unit indicate the importance of successive treatments for killing *R. inerme* and *R. lacustre*. The following program is recommended:

1. The continuation of the special plot studies:

   a. Respraying plots established in 1932.
   b. Establishment of additional series of plots calling for two treatments.

2. The continuation of extensive work as outlined in 1932, with a special large scale test using the method tentatively recommended for control work.

3. The continuation of the use of sodium chlorate and ammonium thiocyanate in the series of tests, with the exception of the elimination of ammonium thiocyanate in the treatment of *R. petiolare*.

4. Development of equipment.

b. A second treatment with a 2% [illegible] applied after a period of [illegible] the resproutings of Pieces. In in case of [illegible] August, the second treatment to be made the following [illegible] treatment to be applied [illegible] relieving hides and their [illegible] and in the case of [illegible] current season to be applied to kill L. [illegible] and L. [illegible] resproutings or dormant. This will require [illegible] solution containing 4 pounds of sodium chlorate per square rod.

[illegible]

Present information on the experiments performed [illegible] eradication at this unit indicate the importance of [illegible] for killing E. [illegible] and L. [illegible]. The following [illegible] recommended:

1. The continuation of the [illegible]

a. [illegible] established in 1935.
b. Establishment of [illegible] as well as for the [illegible].

2. The continuation of extensive [illegible] in 1935, [illegible] special large scale test using the method tentatively recommended for control work.

3. The continuation of the use of sodium chlorate and [illegible] thiocyanate in the series of tests, with the exception of the [illegible] of ammonium thiocyanate in the treatment of [illegible].

4. Development of equipment.

DEVELOPMENT OF RIBES ERADICATION EQUIPMENT

By

John F. Breakey

Agent

INTRODUCTION

The experimental development of two general types of equipment was undertaken in 19[illegible]. Each had for its principal objective the destruction of *Ribes inerme* in wide stream bottoms. One objective was the assembling of a practical power outfit for the broadcast application of chemical and the other was the employing of a tractor for removing brush from stream bottoms.

BROADCAST POWER SPRAYER IN CHEMICAL ERADICATION

A small two-cylinder motor operating a centrifugal pump is located at A (see diagram on following page) which pumps water continually at the rate of 10 gallons per minute directly from the creek through a one-inch diameter hose into two 100-gallon tanks located at B. Dry chemical is mixed into the water in one of the tanks while the solution is being pumped out of the other by the chemical pressure pump. This pump and motor is the regular 4-cylinder Type [illegible] Service [illegible]. Hose 1-1/2" in diameter extends as main trunk line [illegible] from B to D and B to C. T couplings are placed in the trunk line [illegible] D-C for attaching 1-1/4" diameter lateral hose lines at points for spraying the individual areas. The main line and lateral hose lines are in 50-foot sections.

At points D, E, and F lateral hose lines are attached. Spraying lines are laid to form parallel strips approximately 1/2 chain in width. After finishing with an individual section of hose or after completing a strip, the hose is coiled and moved in 50-foot or 100-foot sections directly across to the next strip.

A three-man crew, one man on the motors and two men spraying, was used on the power outfit. The greatest output for this unit in one working day was 4,[illegible] gallons of spray. Solutions of 1-1/4 per cent and 2-1/2 per cent by weight of sodium chlorate were used.

Rams Horn Nozzles

Two rams horn nozzles were given a trial. They gave a better spray distribution than any other nozzle that has been tried. A direct forceful fog spray was secured which carried a considerable distance, penetrated through dense masses of brush, created a draft which caused a more complete coverage of leaves, and permitted better control in the application of the spray as the fog did not spread out in a cone shape like that coming from most nozzles.

DEVELOPMENT OF [illegible]

By

John F. [illegible]

[illegible]

[illegible]

The experimental development of two general types of equipment was undertaken in [illegible]. [illegible] for its principal objective the [illegible] of [illegible] in [illegible] [illegible] the assembling of a [illegible] outfit for the [illegible] of chemical and the other was the [illegible] of a [illegible] for [illegible] brush [illegible].

[illegible] CHEMICAL [illegible]

A small [illegible] located at A (see diagram on following page) [illegible] at the rate of 10 gallons per minute directly from the creek [illegible] [illegible] chemical is mixed into the water in one of the tanks while the solution is being [illegible] out of the other by the chemical pressure pump. [illegible] and motor is the regular 4-cylinder Type N Forest Service fire fighter. [illegible] from B to D and E to C. T couplings are placed in the trunk line hose D-C for attaching 1-1/4" diameter lateral hose lines at points for spraying the individual areas. The main line and lateral hose lines are in [illegible]-foot sections.

At points D, E, and F lateral hose lines are [illegible]. [illegible] lines are laid to form parallel strips approximately 1/2 chain in width. [illegible] a strip, the hose is coiled and moved in 50-foot or 100-foot sections directly across to the next strip.

A three-man crew, one man on the motor and two men spraying, was used on the power outfit. The greatest output for this unit in one working day was 4,500 gallons of spray. Solutions of 1-1/4 per cent and 2-1/2 per cent by weight of sodium chlorate were used.

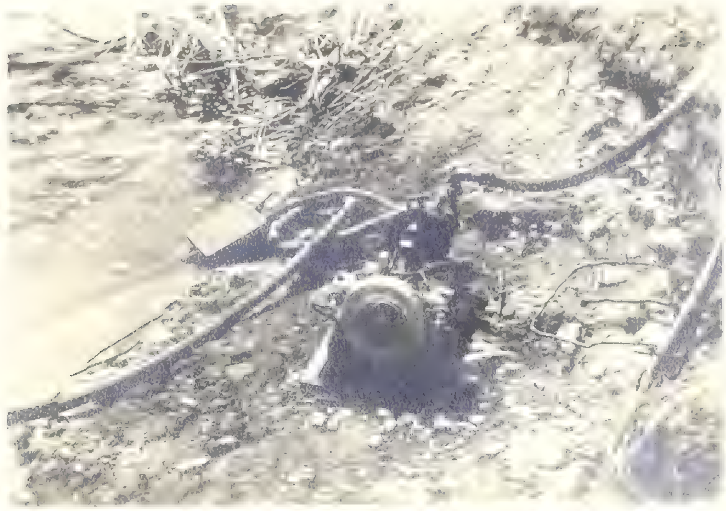
[illegible]

Two rams horn nozzles were given a trial. They gave a better spray distribution than any other nozzle that has been tried. A [illegible] forceful fog spray was secured which carried a considerable distance [illegible] application of the spray as the fog did not spread out in a [illegible] that coming from most nozzles.

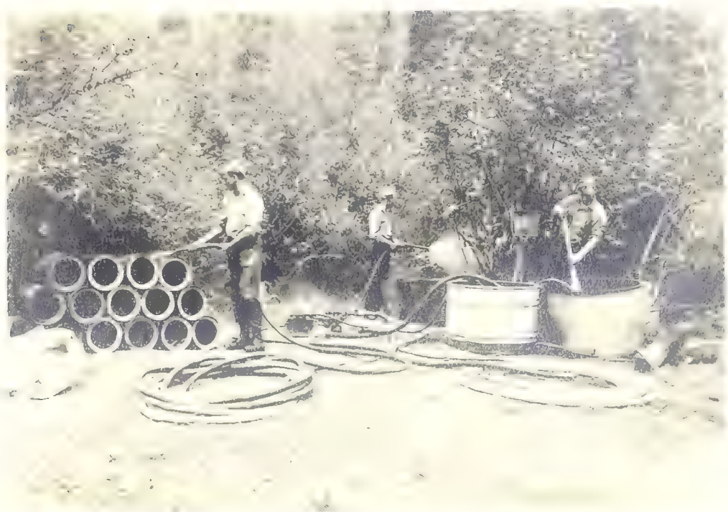
METHOD OF BROADCAST SPRAYING IN STREAM TYPE

ANNUAL REPORT 1932
JOHN F. BREAKEY

DIVISION OF BLISTER RUST CONTROL
DRAWN BY JOHN F. BREAKEY
DECEMBER 7 1932



W. 1098. Water pump. Supplies water to [illegible]



W. 1099. Chemical pump and mixing tubs.

1100 [illegible] control of power outfit for [illegible] drenching and spraying.

Annual Report 1932
John F. Breakey

Certain adjustments were necessary to make these nozzles function properly on the power unit. Other modifications are necessary to make them less cumbersome for use in dense brush. The principle involved in this nozzle is to be adapted for use on the hand spray pumps.

Straight Stream Fire Nozzle for Hand Pumps

Following successful experimentation with fire nozzles in 1931, a straight stream nozzle was devised which provides for stream deflection in mop-up work and also gives good distance where a straight stream is required.

The nozzle has an aluminum base and brass plates for stream deflection. The round plates are set at a 45 degree angle with the nozzle outlet. Certain portions of the plates are cut out. By revolving the plates various streams may be obtained. The plates are held in place by a spring washer. The nozzle has been adopted as standard equipment by the United States Forest Service, Region 1.

BULLDOZER BRUSH REMOVER

Following preliminary tests with a bulldozer equipped for road construction in 1932, a decision was made to construct a special blade for removing brush.

The special blade as constructed consists of ten teeth, 36 inches in length, made from 2 inch square vanadium steel mounted on a crossbar. The crossbar is 8 feet in length and 11 inches deep, and is made from 1/2-inch cold rolled steel. Each tooth is fastened to the crossbar with two heavy U bolts. This makes it possible to adjust the teeth for any desired depth. It was found that 10 inches below the crossbar was the most satisfactory adjustment for rooting out most of the brush on an area. The teeth are set to slope back at an angle of 40 degrees from the vertical frame at the front of the bulldozer. The upper ends of the teeth serve as support for a brush guard. The brush guard is made of light channel iron and is bolted to the crossbar. Each segment of the guard is supported by the top of one of the teeth. In the construction of the blade all corners and braces are electrically welded.

The blade and brush rack are held fast to the bulldozer by three large 1-1/4" x 12" pins. A front and side view of the machine may be seen in the report of C. H. Johnson on experimental work at Clarkia, Idaho.

The purpose of this type of blade is to have the teeth root out and the brush rack hold the brush as the tractor advances forward. Although

Certain adjustments were necessary to make these nozzles function properly at the power unit. [illegible] to make them [illegible] for use in dense brush. The principle involved in this nozzle is to be adapted for use on the hand spray pumps.

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[illegible]

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The purpose of this type of blade is to have the teeth root out and the brush rack hold the brush as the tractor advances forward. Although

certain changes are necessary, the blade proved practical.

STATEMENT OF COSTS OF SPECIAL EQUIPMENT

Equipment for Power Outfit

1,000 feet	1-1/4"	Mill hose (coupled)	$130.83
3	1-1/4"	Brass nozzles	4.94
4	3/4"	Garden hose nozzles	1.50
2	3/4"	Rams horn nozzles	11.92
1-1¼" x 1½"		Siamese with valves	12.00
1-1½" x 1½"		Three-way valve	15.00
1		Centrifugal water pump	20.50
Miscellaneous parts			8.08
Total Cost			$204.77

Bulldozer Brush Remover

1	Brush remover	$295.00
5	Extra teeth for brush remover	45.00
10	Extra U bolts for brush remover	22.50
2	Extra brush racks for brush remover	6.00
Total Cost		$368.50

CONCLUSION

The broadcast power sprayer provides a large volume output for three men. In case the larger volumes of spray do not prove effective, broadcast spraying can be replaced by more selective spraying in which heavier concentrations of chemical are used. Since the output of spray per nozzle is decreased in the more selective type of spraying, it is advisable to increase the number of nozzles on the unit and to substitute 1/2 inch hose for laterals which is more flexible in the brush.

The rams horn nozzle should be reduced in size to make it more suitable for hand spraying.

The standard tracks of the common track laying tractor are not wide enough to carry the weight of the machine in soft wet ground, and the progress is completely stopped in some instances. Wide swamp tracks are more suited to this type of work. The digging teeth of the brush remover should be set on an open frame in order that the dirt may filter through it. A motor driven mechanical shaker would keep the wet earth that sticks to the brush roots from packing between the teeth. The tractor should have a cage or roof to shield the operator from falling snags or brush.

certain changes are necessary, the blade proved practical.

STATEMENT OF COSTS OF SPECIAL EQUIPMENT

Equipment for Power Spraying

1,000 feet	1-1/2" mill hose (complete)	....	[illegible]
1	1-1/4" Brass [illegible]	....	7.54
4	3/4"	Garden hose nozzles	1.30
6	3/4"	[illegible]	11.99
1-1½" x 1½"		Siamese with valves	12.00
1-1½" x 1½"		Three-way valve	15.00
1		Centrifugal water pump	30.50
Miscellaneous parts		....	8.05

Total Cost .... [illegible]

Bulldozer Brush Remover

1	Brush remover	[illegible]
5	Extra teeth for brush remover	48.00
10	Extra U bolts for brush remover	22.50
4	[illegible]	[illegible]

Total Cost $358.50

[illegible]

The broadcast power sprayer provides a large volume output for [illegible]. In [illegible] broadcast spraying can be replaced by more selective spraying in which heavier concentrations of chemical are used. Since the output of spray per nozzle is decreased in the more selective type of spraying, it is advisable to increase the number of nozzles on the unit and to substitute 1/2 inch hose for laterals which is more flexible in the brush.

The rams horn nozzle should be reduced in size to make it more suitable for [illegible] spraying.

The standard tracks of the common track laying tractor are not wide enough to carry the weight of the machine in soft wet ground, and the [illegible] more suited to this type of work. The digging teeth of the brush remover should be set on an open frame in order that the dirt may filter through it. A [illegible] to the brush roots from packing between the teeth. The tractor should have a cage or roof to shield the operator from falling snags or brush.

EXPERIMENTAL RIBES ERADICATION WITH BULLDOZER
CLARKIA, IDAHO

By

C. H. Johnson
Associate Pathologist

INTRODUCTION

A small percentage of stream type in the Inland Empire white pine belt has *Ribes inerme* bushes in very dense concentrations. Extensive experimentation has proven that the cost of treating these areas by the hand pulling method of eradication is prohibitive. Furthermore, extensive experimentation has failed in its object of developing a chemical treatment for *R. inerme* which is economically practicable. Since there are several thousand acres of stream type of this character occurring within the belt of white pine on which blister rust control should be undertaken, it is imperative that a satisfactory method of treatment be developed in the near future.

Almost without exception, in this type of area, Ribes are closely associated with dense, tangled masses of other brush. In order to destroy the Ribes it is necessary to destroy the complete brush cover.

The performance of tractors with bulldozer attachments, while constructing motor ways on the national forests, suggested the possibility of the use of similar equipment for removal of the brush cover on *R. inerme* areas. As a preliminary test, machines were borrowed from road operations in the fall of 1931 and given short runs primarily to ascertain whether or not the machine could operate efficiently in the moist stream bottom soil and whether a special blade for the bulldozer attachment would be necessary. One such test was made on Dry Creek near the Savenac Forest Nursery at Haugan, Montana, and the other in Idaho on the Coeur d'Alene National Forest near the Honeysuckle Ranger Station. The results from both runs were encouraging and it was decided that an extensive trial should be made during the field season of 1932. The Middle Fork of the St. Maries River near Clarkia, Idaho, T. 42 N., R. 2 E. was chosen for the experiment.

PURPOSE OF EXPERIMENT

1. To determine the per acre cost of Ribes eradication by this method.

2. To determine the period of the year during which conditions in stream bottoms permit sufficiently firm footing for tractor operations.

[illegible]

INTRODUCTION

A small percentage of [illegible] the [illegible] pattern.

[illegible]

The performance of [illegible]

[illegible]

1. To determine [illegible]

2. To determine the period of [illegible]

3. To test the adaptability of a blade specially designed for brush removal from stream bottoms and to secure information upon which to base improvements.

4. To determine the relative inflammability of all brush and debris after having lain in the piles or windrows until such time as burning could be safely done.

5. To determine on stream bottom areas from which brush has been removed by tractor the degree to which naturally or artificially established turf or meadow will retard reestablishment of Ribes.

DESCRIPTION OF WORKING CONDITIONS

The Middle Fork of the St. Maries River area was chosen for two reasons:

1. It is located in the center of some of the finest white pine second growth and reproduction in the region and is a part of a protection area upon which Ribes on upland and remaining stream type had already been treated.

2. It represents severe working conditions.

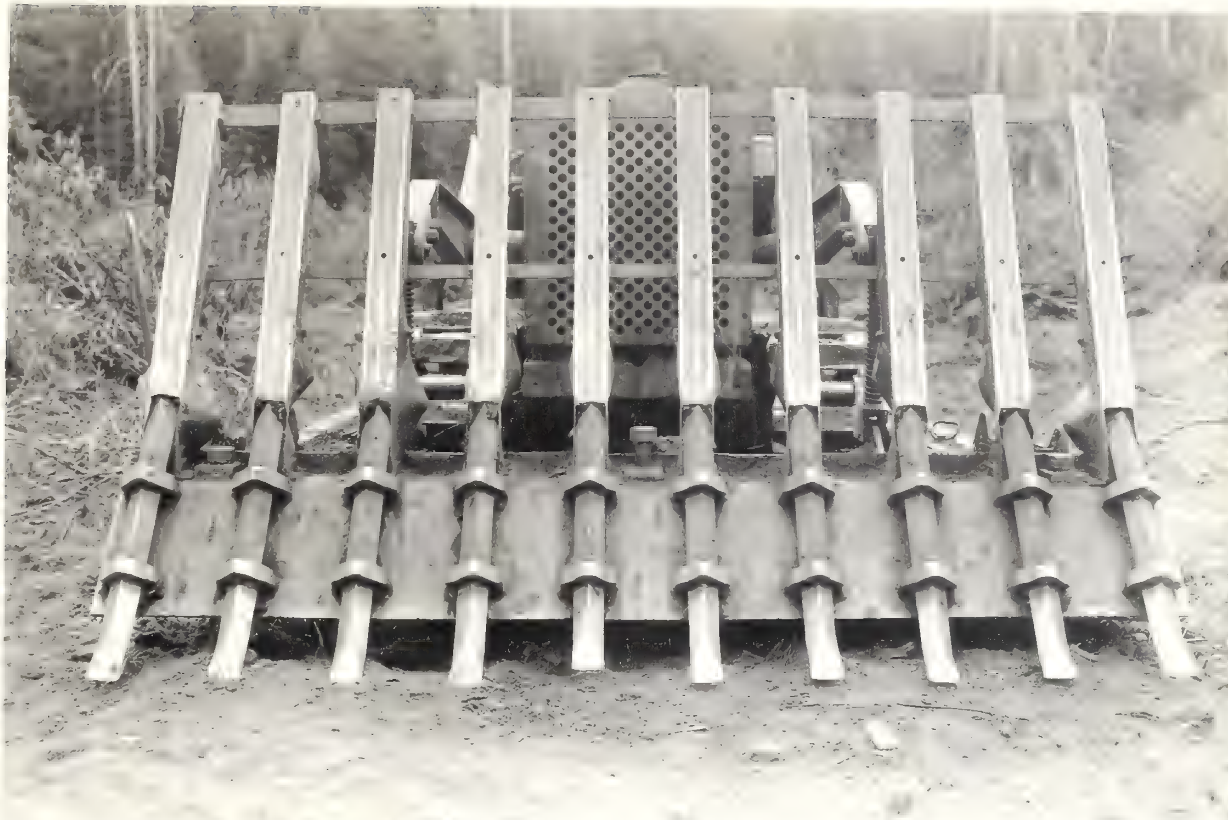
It was believed that if the method proved practical under severe working conditions, a great deal more progress would have been made than if a stream with less severe working conditions had been selected for the experiment. Furthermore, it was felt that conducting the experiment where all conditions were encountered would most quickly reveal any weak links in the method of treatment and that a maximum of experience could be secured in the shortest time.

The area treated included only stream bottom bordering a meandering stream. The brush cover was heavy and down logs were plentiful. Numerous beaver dams added to the difficulty of working.

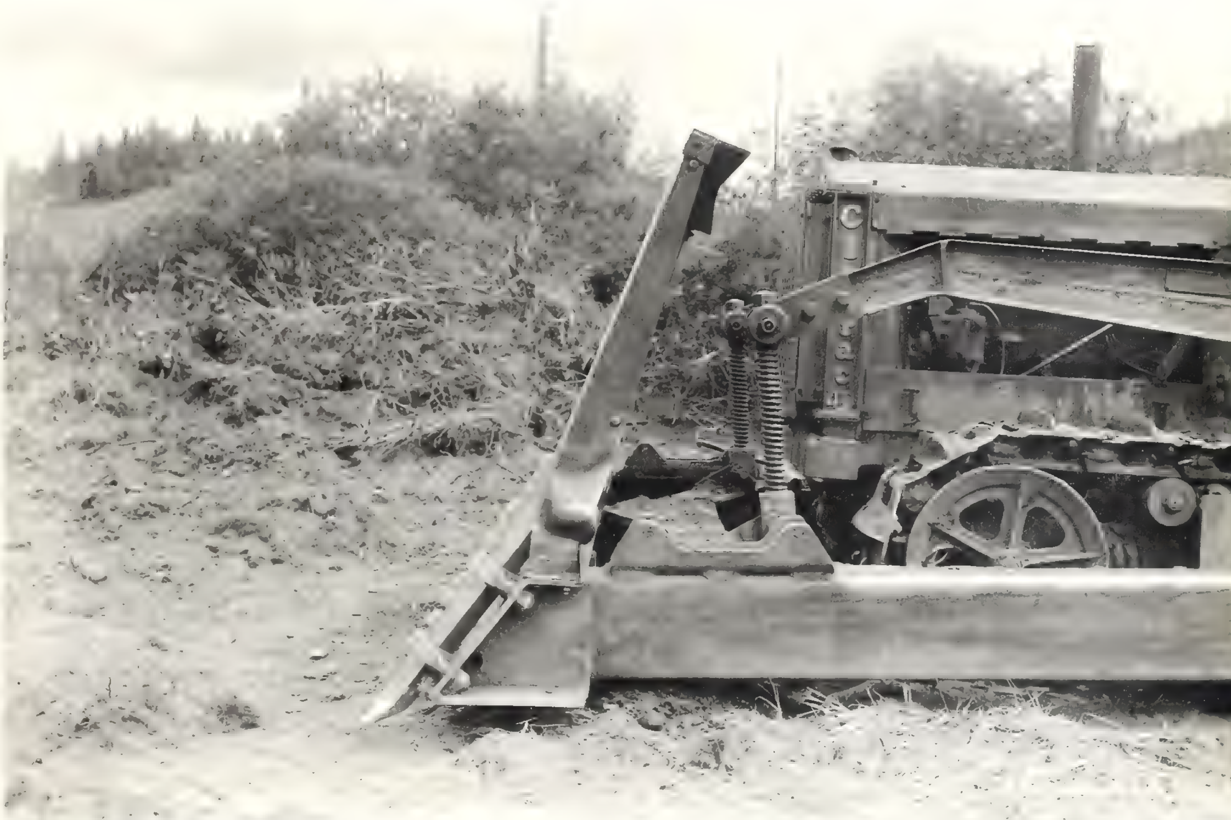
The soil of this valley is so thoroughly saturated with mica, from the exposed mica schist, that traction due to this condition was hindered to some extent.

DESCRIPTION OF MACHINERY AND METHOD OF TREATMENT

A 40-horse power Cletrac tractor, equipped with a bulldozer attachment, was used. This attachment was fitted with a special blade with adjustable teeth for uprooting and piling brush and debris. This assembly



W. 1060. Front view of tractor and bulldozer attachment.



W. 1061. Side view of tractor and bulldozer attachment.

was readily raised and lowered by the operation of a lever controlling the hydraulic lifting and lowering device to the proper position for uprooting, moving or piling brush. The detachable teeth could be adjusted to any depth below the crossbar desired. Pictures accompanying this report show the machinery and the manner in which an area is worked.

Generally stream type area had a few spruce, white fir and trees of other so-called inferior species lightly distributed through the fringes or higher portions. It was the practice to fall these trees onto the piles for the purpose of adding fuel and to reduce the hazard these trees would represent if they were still standing at the time of the burning of the piles and windrows. When these trees were left standing, as was the case when they occurred in large groups, the brush and ribes were piled at a considerable distance from them.

Down logs hindered the progress of the tractor. It was necessary to send a crew of men ahead of the tractor to buck larger logs into pieces which the tractor could move conveniently.

Any convenient place was selected as a starting point for the tractor. Brush was pushed to the nearest point on the site previously designated for the windrow or to the center of the site designated for a round pile. The machine was then backed up for another "bite" or swath. This procedure was continued until clearing to a convenient distance was completed. It was generally the practice to leave a cleared strip anywhere from 20 to 40 feet wide around each pile or windrow. It was also the practice to limit the windrows to lengths which would permit burning by small blocks if necessary.

A small portion of the area was difficult to work owing to beaver channels, small sloughs, beaver dams and bogs. On such portions, work according to a definite plan was out of the question. At best some of these areas were inaccessible to the tractor.

ANALYSES OF RESULTS

The cost of work done on the project is shown in Table No. 1.

TABLE NO. 1

STATEMENT OF COST OF OPERATION

Item of Expenditure		Main Operation Middle Fork	Trenching Burning and Preparation for Burning Gold Center Creek	Total
Salaries	Permanent	$ 530.00	$137.50	$ 667.50
	Temporary	1,461.03	563.00	2,024.03
Subsistence	1,090 meals @ $.35	306.25	75.25	381.50
Tractor	Rental	1,007.13	150.00	1,157.13
	Transportation	267.20	-	267.20
	Repairs	16.90	-	16.90
	Gas Used	125.93	17.41	143.34
	Oil Used	50.20	7.00	57.20
	Grease and Track Oil	25.69	2.80	[illegible]
	Bulldozer Blade	388.50	-	388.50
Equipment	Cost (new)	9.66	-	9.66
	Repairs (used)	45.56	-	45.56
Transportation of Equipment and Supplies		88.85	12.00	100.85
Expenses and Transportation of Permanent Men		85.00	-	85.00
Miscellaneous Expenses		5.08	15.45	20.53
Seed		61.75	-	61.75
Grand Total		$4,566.75	$[illegible].21	$[illegible].96

The cost figures in which we are most interested are the ones pertaining to the actual clearing operation on the Middle Fork of the St. Maries River. It will be noted that the full time of a permanent employee for the field season is charged. On a going operation it should not be necessary to assign a full time permanent employee to supervise the work. The cost of the blade should not be charged against the per acre cost, nor should the cost of seed purchased for seeding following the burning of brush be included.

The machine rented from the Forest Service was needed on a road operation in July. Thus it was necessary to rent another machine, the only one available, which had to be shipped from Seattle and returned there at the end of the season. As a result of this delay, in addition to weather and other factors, a machine was available for field use for approximately one-half the working season. Ordinarily the transportation

charge for a machine should not exceed $75.00 for a half of the season's run.

Thus the cost of this operation should be $4,568.75 minus the following:

$368.50	- cost of blade built by hand for experimental purposes.
61.75	- seed
282.20	- excessive transportation
275.00	- excessive supervision due to operation being an important experimental venture.
$987.45	- deductions
$3,581.30	- net cost clearing operation

Analysis of Clearing Time for Tractor

Actual hours clearing	317-1/4
Actual hours tractor under repair	42-1/2
Actual hours tractor bogged in mud	30-3/4
Actual hours cooling engine	4-1/2
Actual hours lost time moving between areas	5-1/2
Total hours possible for clearing	400-1/2

Average cost per hour for actual clearing time is $\frac{\$3,581.30}{317.25}$ or $11.29

Analysis of Cost of Operating Tractor on Basis of Actual Hours Clearing

Tractor Costs	Total	Average Per Hour
Rental	$1,007.13	$3.17
Transportation of tractor	75.00	.24
Field repairs	16.90	.05
Gasoline, 868 gallons @ $.14507	125.93	.40
Crank case oil	50.20	.16
Grease and track oil	25.89	.08
Grand Total	$1,301.05	$4.10

Analysis of Costs on Basis of Acreage Cleared

Cost of operation	$3,581.30
Acres cleared for burning	62
Average cost per acre	$57.76

Area Burned on a Control Basis and Additional Area Prepared for Burning Experiment in 1933.

Unfortunately a fire, the circumstances of which show that it was of incendiary origin, swept across the bulk of the cleared area in the face of a high wind about the middle of September. At the time of this fire preparations were under way for controlled burning of brush piles and windrows as soon as weather conditions would render it safe. The portion of brush not burned in the September fire was later burned on a controlled basis under the direction of the ranger in charge of the Clarkia district.

Two contiguous areas, about 60 acres on the Main Fork just east of the junction of Gold Center Creek with the main stream, and about 20 acres on the South Fork extending from the junction to a point one-half mile south, were surrounded with a fire lane about 10 feet wide. This fire lane was constructed by hand labor. The purpose was to make burning safe so that fire could be used subsequently to destroy brush and Ribes. On the South Fork area, R. petiolare bushes had been sprayed the previous year. Hence a portion of the brush is now dead and should be an aid to future burning.

Owing to the lateness of the season when the work was done, it was found that burning could not be successfully done, so it was decided to complete the experiment during the spring or fall of 1933.

In addition to the above, a fire lane was constructed extending the entire distance from the Gold Center junction to the western limits of the area on which work was done during the season. This fire lane was several miles in length and was constructed by machine.

Column 3 of Table No. 1 shows the cost of this work.

Seeding Experiment

Following clearing and burning, various species of sod-forming grasses were sown on portions of the area to demonstrate to what extent sod so established would constitute a barrier to the reestablishment of Ribes. Results from similar sowings made at the Savenac Forest Nursery in Montana indicate that density of sod is the chief factor determining the success of this method of controlling new Ribes growth.

CONCLUSIONS

In view of the fact that the St. Maries River area represented conditions more severe than will ordinarily be encountered, and it was even doubted by many that a heavy tractor could perform on much of the

[illegible]

Unfortunately a fire, [illegible]

[illegible]

[illegible]

In addition to the [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

In view of the fact that [illegible]

W. 1058. Stream bottom area on Middle Fork of St. Maries River in which Ribes inerme and other species of Ribes are very abundant, practically massed in places. No preparation for working yet made.

W. 1059. The same area as above with the clearing partially completed. The machine will clear from one to two acres of this type per day depending upon the adverse conditions encountered.

area, high costs of treatment were expected. However, the tractor was able to work on more than 80 per cent of the area at costs which were lower than those resulting from previous experiments with other methods. This is ample reason for believing that this method offers sound possibilities.

On dry brushy sites complete brush removal, together with soil disturbance was obtained to such an extent that efficiency of eradication and effectiveness of control were never in doubt.

Wet ground constituted the greatest obstacle in the way of successful operation. Without good traction the best that could be achieved was a patchy and partly finished job. Difficulty was always encountered in attempting to remove brush from the edge of streams where generally there is a strip of brush varying in width from 4 to 6 feet which, due to the insecurity of the ground, could not be cleared with the tractor. Narrow patches of brush situated between abruptly rising timbered slopes and the stream were always hard to work because an excessive number of windfalls were present or the stream type area was too narrow to permit a satisfactory disposal of the brush. In most cases the greater portion of the brush was removed and the areas were made more accessible for hand pulling and spraying work.

As a result of experience gained during the 1934 operation, it is very strongly urged that similar work in any normal season be not undertaken before July 1. Previous to this time stream bottom soil is too boggy to permit satisfactory work by the tractor except on areas well drained or with a gravel bottom.

The bulldozer blade which was especially designed for this operation proved satisfactory. However, too much soil is still moved onto piles, together with the brush and debris. Some changes have been made to overcome the faults of the machine and no doubt further improvements can be effected.

For reasons given previously in this report practically no information could be secured with regard to the success of burning under controlled conditions.

The work of beavers constitutes a decided handicap to tractor work in stream type. Dams must be opened and the water kept down for several weeks in advance of actual working with a tractor.

From past experience in brush clearing it is safe to conclude that no extensive piece of ground can be completely worked with a tractor. Hand pulling or spraying should play a prominent part on a brush clearing operation.

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This is ample reason for believing that this method offers [illegible]

On dry ground, after complete brush removal, together with [illegible] disturbance was obtained to such an extent that efficiency of eradication and effectiveness of control [illegible].

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From past experience in brush clearing it is safe to conclude that no extensive piece of ground can be completely worked with a tractor. Hand pulling or spraying should play a prominent part on a brush clearing operation.

Wide sweep tracks for the tractor might prove very helpful to the unit.

Burning must be done as weather conditions permit and as a result complete disturbance, which is the object of burning, cannot always be obtained. Whenever it can be avoided, brush removed with a tractor should not be piled against live brush. Burning weather cannot be anticipated in advance and if loose brush in a windrow or pile must be held over for an indefinite period, it will if thoroughly uprooted become dry and partly decomposed. The cost of burning dry brush is considerably below that of burning green brush.

SPECIAL METHOD STUDIES ON THE CLEARWATER TIMBER PROTECTIVE ASSOCIATION

By
B. A. Anderson
Junior Forester

1. Treatment of Ribes petiolare Growing in Beaver Dams.

It is possible to secure a 100 per cent kill of R. petiolare with a 10 per cent solution of sodium chlorate on almost any site except where these bushes are partially covered by water. This condition frequently exists above beaver dams. Extensive experience in spraying this species of Ribes in all the regions where these particular conditions exist reveals the fact that in practically no case have satisfactory kills on R. petiolare resulted. Apparently the failure is due to the Ribes crowns and roots being submerged by the backwater from the beaver dams. During the past summer a series of experiments were run to determine whether draining the dams before spraying the R. petiolare would result in a better kill.

A series of beaver dams, suitable for experimental purposes, were located on Elk Creek near the Oxford Ranger Station. The dams were kept open for varying lengths of time. It was possible to lower the water in all of the ponds from about 8 inches at the upper end to approximately 18 inches at the dam. Lowering the water level this amount made it possible to thoroughly drench with spray almost 100 per cent of the live stem and a large proportion of the water roots which were present.

In all of the beaver ponds the R. petiolare occurred in patches of different sizes with varying percentages of the total amount of live stem of the bushes submerged in the water. These patches were marked and after draining the pond no patch was sprayed before an estimate was made of the live stem still submerged.

After each of the ponds had been held open the requisite number of days, the dams were then carefully rebuilt so as to bring the water level to exactly the same height as before draining.

Two control plots were used. On the first the Ribes were sprayed without lowering the water lever; on the second plot the dam was blown out and drained but the Ribes were left without spraying.

The plots were sprayed during the period July 28 to August 2 and were inspected at regular intervals until September 15. At that time R. petiolare in the undrained control plot was resprouting in sufficient amount to reestablish itself within two or three years. On every plot that had been drained before spraying the R. petiolare showed no signs of resprouting.

TABLE NO. 1

RECORD OF TREATMENTS [illegible]
IN AND AROUND BEAVER DAMS

Plot Number	Area of Beaver Ponds Acres	Date Dam Opened	No. of Inches Fall of Water 10 Feet Above Dam	Date Sprayed	No. Gals. of 10% $NaClO_3$ Solution Used	Length of Time Dam Open
1-Control	0.3	-	-	Jul. [illegible]	[illegible]	
2	0.3	Jul. 27	15	Jul. 28	20	14 Days
3	0.3	Jul. 28	11½	Jul. 29	23	7 Days
4	0.3	Jul. 29	15	Aug. 3	52	3 Days
5	0.1	Aug. 2	14½	Aug. 3	10	3 Days
6-Control	0.1	Aug. 2	14	Not sprayed. Left as opened.		

The various plots will be rechecked during the 1933 field season for final results.

2. Eradication of R. viscosissimum Growing in Dense Brush, by Lopping off the Live Stem at Ground Level.

The removal of R. viscosissimum when growing in dense brush on old burns is perhaps the most difficult problem with which hand pulling crews in the Inland Empire are forced to contend. Where the roots of the Ribes bushes are interwound with those of willows, Ceanothus, alders, etc., it is extremely difficult to hand pull them. To remove the Ribes from these sites it is necessary for the eradication crews to use tools of various sorts--Pulaskis, trench picks, grub hoes--anything with a cutting or prying device. The brush must be removed in the majority of cases before the Ribes crown can be pried out.

Ribes on these sites as a general rule have an immense crown with three or more very large semi-tap roots. The live stem usually consists of 2 or 3 main branches starting directly from the crown. These branches as a rule are brittle and break off easily. The presence of a large number of dead main branches indicates that competition with the dense brush is severe.

The struggle for existence by Ribes is so severe on these sites that it seems probable that if they received any particular set-back, they would be unable to survive. To test out this theory approximately a thousand bushes of R. viscosissimum located in dense brush were lopped off at the ground level, above the crown. Ordinarily these bushes would re-establish themselves during the following year. In the face of the severe competition by dense brush it is doubtful if all bushes will survive. The results of this experiment will be available at the end of the 1933 field season.

[illegible]

[illegible table]

The various plots will be rechecked during the [illegible] field season for final results.

[illegible]

[illegible] before the Ribes crown can be pried out.

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[illegible]

BLISTER RUST CONTROL ON THE CLEARWATER NATIONAL FOREST
SEASON 1932

By
Herman E. Swanson, Agent
Neal C. Nelson, Agent
Frank O. Walters, Agent
Division of Blister Rust Control
Paul H. Gerrard, Assistant Supervisor
Forest Service

INTRODUCTION

Ribes eradication operations for the control of white pine blister rust on the Clearwater National Forest during the 1932 season called for the complete working of both stream and upland types. The plan in 1929 and 1930 was to eradicate the Ribes from along streams where the bulk of the Ribes as well as the most susceptible species occur. In 1931 the plan was changed to include the eradication of Ribes occurring in heavy concentrations on the uplands.

As a delay measure against blister rust the program of stream type Ribes eradication has been effective. It has served to protect temporarily four times the area of white pine that a program of complete Ribes eradication on uplands and in stream type could have accomplished during the same period. This is evidenced to a certain extent by the fact that only one infection is known to have come in on areas where Ribes had been eradicated from stream type. This one exception is a light infection on _Ribes petiolare_ seedlings which sprouted on an area after spraying was done in 1929 and which has not yet been reworked. Although but a short time has elapsed since work done in 1929 and 1930, if Ribes had not been eradicated from the streams on these areas, much infection would probably be scattered through them. The other eight known infection points on or adjacent to the present protection area came in before stream type eradication had been done. Since blister rust was becoming more established on the forest, the plan of complete Ribes eradication was inaugurated in 1932.

In conjunction with the Forest Service work, the Division of Blister Rust Control maintained a camp on Orogrande Creek engaged in the testing of various chemicals on _R. inerme_.

LOCATION AND DESCRIPTION OF AREAS

Musselshell, Lolo and Eldorado Creek Drainages

This area includes working units 1 to 4. Each drainage has timber stands of varied age classes which have a great influence on Ribes distribution. The mature stands were relatively free from Ribes and required

BLISTER RUST CONTROL ON THE CLEARWATER NATIONAL FOREST
SEASON 1951

By
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[illegible], Agent
[illegible], Agent
Division of Blister Rust Control
[illegible], Assistant Supervisor
Forest Service

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Ribes eradication operations for the control of white pine blister rust on the Clearwater National Forest during the 1951 season called for the complete working of both stream and upland types. The plan in 1949 and 1950 was to eradicate the Ribes from along streams where the bulk of the Ribes as well as the most susceptible species occur. In 1951 the plan was changed to include the eradication of Ribes occurring in heavy concentrations on the uplands.

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In conjunction with the Forest Service work, the Division of Blister Rust Control maintained a camp on Eldorado Creek engaged in the testing of various chemicals on *R. lacustre*.

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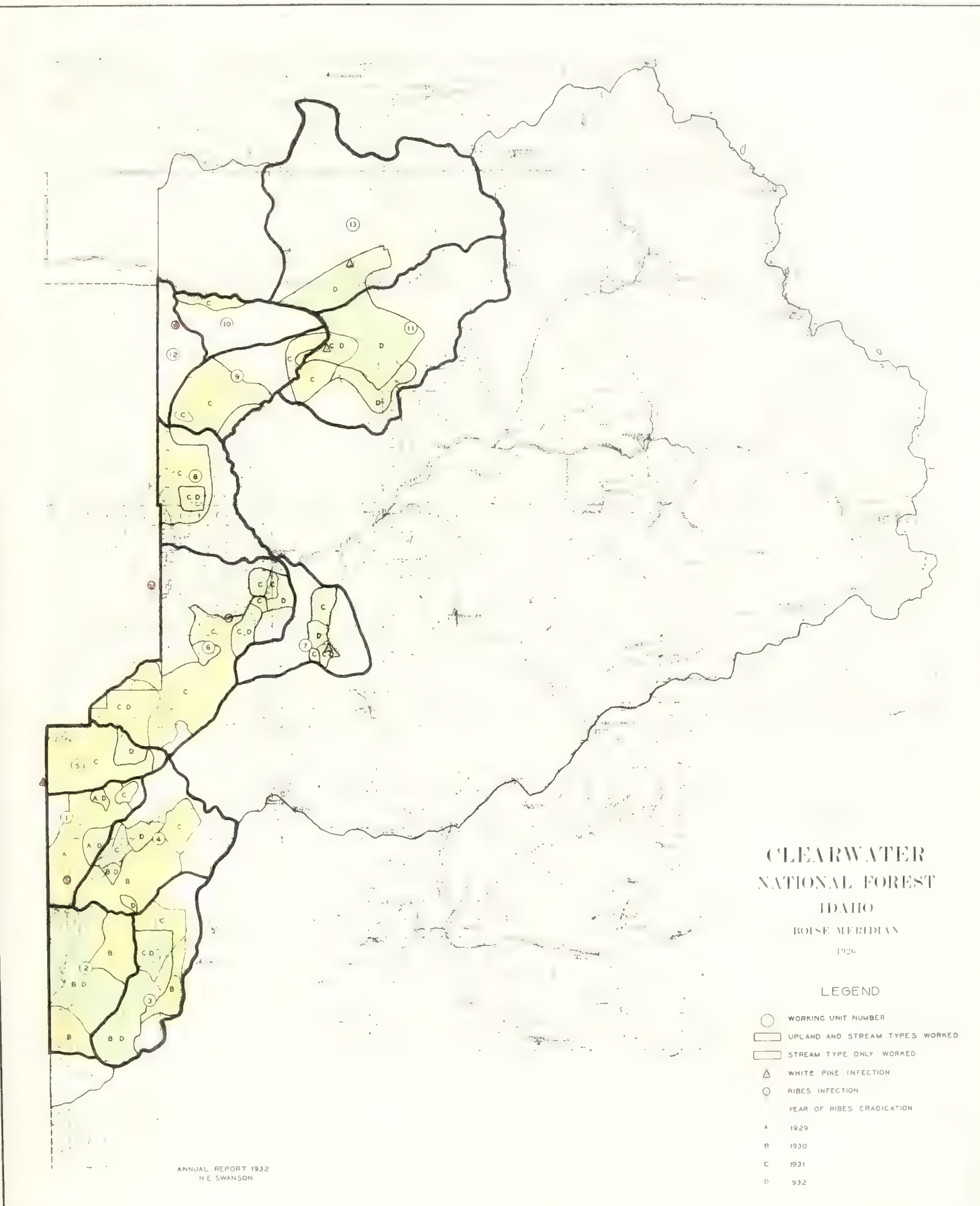
Musselshell, Lolo and Eldorado Creek Drainages

This area includes working units 1 to 4. Each drainage has stands of mixed age classes which have a good [illegible] in Ribes [illegible]. The mature stands were relatively free from Ribes and [illegible]


CLEARWATER
NATIONAL FOREST
IDAHO
BOISE MERIDIAN
1926
LEGEND
WORKING UNIT NUMBER
UPLAND AND STREAM TYPES WORKED
STREAM TYPE ONLY WORKED
WHITE PINE INFECTION
RIBES INFECTION
YEAR OF RIBES ERADICATION
A 1929
B 1930
C 1931
D 932
ANNUAL REPORT 1932
H.E. SWANSON

very little work. The reproduction stands contained many Ribes. Especially difficult for working were two large reproduction stands, one on upper Musselshell Creek and the other on Lolo Creek below the North Fork. A very fine stand of white pine reproduction comprising about 5 sections is located north of Mud Creek Lookout on Eldorado Creek. The density of this stand has served to shade out a considerable amount of the Ribes and associated brush, and only a small portion of the stand was difficult to work.

The areas at the heads of these three creeks run low in pine value and were eliminated from the control area. In doing this, due consideration was given to establish boundaries which would give protection to adjacent areas of good white pine.

The topography in this district is less rugged and steep in comparison with the rest of the forest.

<u>Orofino, French and Orogrande Creek Drainages</u>

This area includes working units 5 and 6. Orofino Creek drainage consists of varied age classes. The pole and mature stands required very little work. Reproduction stands and ridge tops supported a heavy Ribes growth and presented difficult working conditions.

The main fork of French Creek contains principally an excellent pole stand of white pine with some reproduction and mature stands spotted through it. Some of this area has been grazed over by sheep which has served to suppress much of the Ribes and brush growth. A condition on this area which has not been found on any of the other working units, is the wide distribution of *R. petiolare*. Not only did the main streams support a heavy growth of *R. petiolare* but there are numerous small seepages within the pine stand and also above it which had *R. petiolare* scattered along their course. These Ribes grew in close association with dense alder patches which made searching and spraying very difficult. The concentrations of Ribes were sufficiently heavy to make hand pulling impractical. Thus far only stream type work has been done on this area.

The areas worked on the east side of lower Orogrande Creek supported fine stands of white pine. As on other areas, the pole and mature stands required very little work. The reproduction stands do not comprise very large contiguous blocks, although there is a considerable amount of white pine reproduction scattered over the area. The patches of reproduction on Pine Creek are so located that they were hard to reach, and while not supporting a heavy Ribes growth were difficult to work because of the steep slopes, windfalls and dense brush.

W. 1079. Difficulty factors. Open reproduction. 2,000 R. viscosissimum per acre. Windfalls, brush and slope.

W. 640. Ribes free. Dense pole, ground cover shaded out. Scouting only necessary on area.

Weitas and Cabin Creek Drainages

This area includes working unit [illegible]. The work outside of stream type was confined to the west side of Weitas Creek in the vicinity of the Weitas Ranger Station. The greater part of the area worked is classed as open reproduction. It had a very high Ribes population and is characterized by steep slopes, heavy windfall and brush conditions. R. inerme and R. petiolare were heavy on Weitas and Hemlock Creeks. A block of sixty acres covered with R. inerme remains on Weitas Creek to be worked with a bulldozer.

The very difficult working conditions and heavy Ribes growth over all this area have made the protection costs high. The area is also threatened by a heavy blister rust infection on Hemlock Creek which came in before Ribes eradication was started.

Skull, Quartz and Rock Creek Drainages

This area includes working units 11 and 13. The timber, mostly white pine type of [illegible] years or more in age, may be classed as [illegible] mature. There was very little brush or windfall, except in small patches. Ribes were few in the mature timber. They were found in scattered patches along the streams and only in some of the open areas on the slopes and ridges were they heavily concentrated. These drainages are marked by steep, narrow canyons having an average side slope of about 50 per cent with more abrupt slopes and rock outcrops occurring on the east-facing slopes.

This was the only unit upon which no previous work had been done. It represents the lowest cost work and also the largest solid block upon which complete Ribes eradication has been done.

Washington Creek Drainage

In working unit 6, on a tributary of Washington Creek, a block of about 1,000 acres of white pine reproduction was worked. This area was similar to other reproducing areas in having a heavy Ribes growth and dense brush conditions.

General

Although the forest is being opened up with roads, which simplifies the transportation problem, it was necessary to pack into 19 of the 20 camps. The distance ranged from a few miles up to 28 miles. In order to establish camps at the most advantageous places for working an area, it was necessary to build new trails in many cases.

W. 1095. Difficulty factors. R. lacustre hidden by brush and down log.

W. 1096. R. lacustre revealed by moving surrounding brush and log.

ORGANIZATION

The organization of the project was the same as in 1931. A forest officer of the Clearwater National Forest, whose responsibilities and duties were chiefly those pertaining to organization and maintenance of camps, was in charge of the operation. Working in cooperation with him was a project leader from the Division of Blister Rust Control whose responsibilities and duties pertained chiefly to the supervision of the work in the field. These men were assisted by three unit supervisors each of whom directed the work of six or seven camps.

The project consisted of 20 camps with 21 or 25 men in each. Approximately 430 men were connected with the Ribes eradication work.

The Division of Blister Rust Control maintained an independent checking organization of ten men, one man for every two camps, to make a systematic check of all the area worked.

PERSONNEL

It was possible this year to secure a better type of labor because of the general unemployment situation. However, the turnover in men was greater than it had been in previous years. This was due in part to wage reductions taking place on July 1, and in part to the large number of new men who were hired under the policy which was necessarily adopted to relieve the unemployment situation in the region.

Although the large number of men who remained throughout the season constituted the strongest and most efficient field organization that has been engaged in Ribes eradication on the Clearwater National Forest, the large turnover among the other men was a drain on the output and efficiency of the entire project. On the basis of tests made in former years in the training of men, the average daily output during the first ten days of work is 30 per cent to 50 per cent less than the average output for the balance of the season. This loss in output amounts to about $26 per man based on effective man-day costs. With a total turnover of more than 102 men during the summer this loss in output represents an important item--approximately $2,652.00. The hindrance which an inexperienced man is to an experienced crew and the attention which he requires from the crew leader has not been considered in this loss although they are a real cost of training.

For the most effective field force, it is necessary to have a nucleus of capable, experienced men with a good knowledge of the fundamentals in methods of work. In 1931, on the first large scale operation, this group constituted about 20 per cent of the total number of men hired, which was not adequate as a trained nucleus. In 1932 about 33 per cent of the men

[illegible]

The organization of the project was the same as in 1931. [illegible] forest officer of the Clearwater National Forest, whose responsibilities and duties were chiefly those pertaining to organization and maintenance of camps, was in charge of the operation. Working in cooperation with him was a project leader from the Division of Blister Rust Control whose responsibilities and duties pertained chiefly to the supervision of the work in the field. These men were assisted by three [illegible], each of whom directed the work of six or seven camps.

The project consisted of [illegible] camps with [illegible] men in each. Approximately 480 men were connected with the [illegible] eradication work.

The Division of Blister Rust Control maintained [illegible] checking organization of ten men, one man for each [illegible] systematic check of all the area [illegible].

[illegible]

It was [illegible] this year to secure a better type of [illegible] because of the general unemployment situation. However, the turnover in men was greater than it had been in previous years. This was [illegible] wage reductions taking place on July 1, and in part to the large number of [illegible] men who were hired under the policy which was necessarily adopted to relieve the unemployment situation in the region.

Although the large number of men who remained throughout the season constituted the strongest and most efficient field organization that has been engaged in Ribes eradication on the Clearwater National Forest, the large turnover among the other men was a [illegible] in the output and efficiency of the entire project. On the basis of tests made in former years in the training of men, the average daily output during the first ten days of work is [illegible] per cent less than the average output for the balance of the season. This loss in output [illegible] per man based on effective man-day costs. With a total turnover of more than 102 men during the summer this loss in output represents an important item--approximately $2,652.00. The hindrance which an inexperienced man is to an experienced crew and the attention which he requires from the crew leader has not been considered in this loss although they are a real cost of training.

For the most effective field force, it is necessary to have a nucleus of capable, experienced men with a good knowledge of the [illegible] in methods of work. In 1931, on the first large scale operation, this group constituted about 20 per cent of the total number of men hired, which was not adequate as a trained nucleus. In 1932 about 45 per cent of the [illegible]

hired were experienced. This percentage is a minimum requirement for it represents about one experienced man for each crew. To insure an effective organization which will function from the start of the season to the close, a nucleus of 50 per cent capable, experienced men, who are known to stay the entire season, is advisable. Unfortunately, in 1933, about 50 satisfactory men with one year's experience on Ribes eradication were disqualified under the policy which was necessarily adopted to relieve most satisfactorily and impartially the pressing unemployment situation in the region.

USE OF BLISTER RUST CREWS ON FIRES

During the season the call for blister rust men as smoke chasers was not heavy but practically all of the camps were called out to four larger fires, two on the Selway National Forest and two on the Clearwater National Forest. Time spent by the crews on each fire varied from three to nine days. A total of 2,760 man days was chargeable to fire suppression. This represents more than 8 per cent of the total man days spent on the entire season's job and 13 per cent of the total effective man days on Ribes eradication. Although the man days on fire were paid for out of fire funds, there are certain losses resulting from the interruption in the steady and uniform progress of the work, the temporary reduction in the efficiency of the men, and the fewer number of man days over which fixed charges are spread which are not equalized. This last item increases the effective man-day costs.

Blister rust crews are a planned element in the fire control forces on the forest. To prevent excessive interference with blister rust control operations, the Forest Service adopted a policy which gave due consideration to fire emergency, but eliminated unnecessary holding of men in camp awaiting call to fire and extended duty on fire patrol.

....

METHODS AND EQUIPMENT

The methods and equipment used on Ribes eradication work were for the most part the same as those used in 1930 and are more fully described in that report. For hand pulling work the standard 3-man crew was used, except on some areas with large numbers of Ribes where one and 2-man crews were used to advantage.

In chemical work sodium chlorate in a 10 per cent solution (.9 lb. per gallon of water) was applied to R. petiolare with hand pumps.

To insure good work, all the area was inspected by a checking organization of 10 men. The check consisted in a systematic cruise of 3 per cent to 4 per cent of the area worked. Any areas on which the Ribes growth had not been reduced to approximately 50 feet of live stem per acre were reworked.

hired were experienced. This percentage is a minimum requirement [illegible] represents about one experienced man for each crew. To insure an [illegible] organization which will function from the start of the season to the end, a nucleus of 60 per cent capable, experienced men, who are known to stay the entire season, is advisable. Unfortunately, in 1953, about 40 satisfactory men with one year's experience on Ribes eradication were disqualified under the policy [illegible] permanently adopted [illegible] most satisfactorily and [illegible] in the region.

[illegible]

During the season the call for blister rust men as smoke chasers was not heavy but practically all of the camps were called out for four larger fires, two on the Selway National Forest and two on the Clearwater National Forest. Time spent by the crews on each fire varied from three to nine days. A total of 2,760 man days was chargeable to fire suppression. This represents more than 6 per cent of the total man days spent on the entire season's job and 13 per cent of the total effective man days on Ribes eradication. Although the man days on fire were paid for out of fire funds, there are certain losses resulting from the [illegible] over which fixed charges are spread which are not equalized. This last item increases the effective man-day costs.

Blister rust crews are a planned element in the fire control forces on the forest. To prevent excessive interference with blister rust control operations, the [illegible]

[illegible]

The methods and equipment used on Ribes eradication work were for the most part the same as those used in 1952 and are more fully described in that report. For hand pulling work the standard 5-man crew was used, except on some areas with large numbers of Ribes where one and 2-man crews were used to advantage.

[illegible] 10 per cent solution (.9 lb. per gallon of water) was applied to [illegible]

To insure good work, all the area was inspected by a [illegible] organization of 10 men. The check consisted in a systematic [illegible]

PROGRESS

Approximately 42 per cent of the present control area has been completely worked. An additional 38 per cent has been given partial protection by the working of stream type. On the remaining 20 per cent no Ribes eradication work has been done.

A report is being prepared which will include a summary of all past work, together with plans and estimates for completing the present control area.

STATEMENT OF EXPENDITURES

I. Expenditures by appropriations, calendar year 1932,
Fiscal year 1932 (last half)

A. Forest Service blister rust appropriations....$35,489.14
B. Division of Blister Rust Control appropriations.......... 7,337.44
Total.......... $42,826.58

Fiscal year 1933 (first half)

A. Forest Service blister rust appropriations -
1. Actual.......... $78,816.93
2. Outstanding obligations.......... 5,206.46
Total.......... $84,022.39
B. Division of Blister Rust Control appropriations.......... 12,245.34
Total.......... $96,267.73

Grand total, both fiscal years.......... $139,094.31

II. Classified expenditures, calendar year 1932.

A. Salaries -
   1. Forest Service............$1,831.94
   2. Division of Blister
      Rust Control............ 9,833.57 $11,665.51

B. Wages -
   1. Forest Service............$64,673.91
   2. Division of Blister
      Rust Control............ 8,889.89 73,563.80

C. Travel and transportation -
   1. Forest Service............$15,811.56
   2. Division of Blister
      Rust Control............ 337.32 16,148.88

D. Subsistence supplies...................... 27,960.75

E. Supplies and equipment -
   1. Purchase of equipment and
      supplies -
      (a) Camp.................. $3,360.09
      (b) Eradication.......... 3,752.55
      (c) Other................. 138.77 7,251.41

F. Miscellaneous expenses...................... 1,484.16

Total.......................................$139,094.31

III. Activity costs, calendar year 1932.

A. Supervision -

1. Direct project supervision		$11,361.01	
2. Checking		2,519.16	
3. Overhead, S. O. S.		1,231.73	
4. Overhead office work employment		9,458.55	
5. Preeradication survey		1,906.70	
6. Travel		1,120.74	28,077.72

B. Transportation -

1. Transportation of men		140.00	
2. Freight, express, drayage		984.78	
3. Truck transportation		2,761.85	
4. Pack transportation		11,366.35	15,251.98

C. Equipment -

1. Storage		$336.35	
2. Equipment		285.85	
3. Maintenance (wages and expendable repairs)			
(a) Camps	$2,209.91		
(b) Eradication	39.50		
(c) Other	33.35	2,282.76	2,904.96

D. Depreciation of equipment -

1. Camp		3,941.62	
2. Eradication		593.22	
3. Other		139.15	4,673.99

E. Chemicals and supplies -

1. Chemical		2,904.83	
2. Glue		17.60	
3. Twine		603.98	3,526.41

F. Camps -

1. Camps (construction and maintenance)		2,007.07	
2. Trail work " " "		221.50	
3. Telephone communication and maintenance)		170.92	2,399.49

G. Hand pulling			79,510.30
H. Chemical eradication			4,400.09
I. Miscellaneous expense			30.00
Total cost of project			$140,794.78

Note: 1. Depreciation charges on equipment used but purchased out of funds in previous years accounts for the difference between total cost of project and total expenditure for the current year.

2. For more detailed report on expenditures and costs see report of January 4, 1933, by P. H. Gerrard of the Forest Service.

IV. Composite costs -

Man day on hand work...............$6.48.

Man day on chemical work..........[illegible]

Gallon of chemical..................05.

Initial Ribes eradication operations -

Hand, 19,0[illegible] man days @ $6.48..................$1[illegible],[illegible]5.90

Chemical -

Labor, 3[illegible] man days @ $6.93..15,671.09

Chemical, [illegible],738 gallons

@ $.08.............................3,0[illegible].17

Total.................................[illegible],728.0[illegible]

Total for hand and chemical eradication.......... $1[illegible]

Second Ribes eradication operations -

Hand, 915 man days @ $[illegible].48.......................$5,930.05

Chemical -

Labor, 292 man days @ $6.85...11,995.77

Chemical, 5,091 gallons @ $.08. 406.90

Total...................................2,402.57 [illegible]

Total for initial and second Ribes eradication operations...$140,7[illegible]

RESULTS OF RIBES ERADICATION OPERATIONS

The results of Ribes eradication operations are presented in the following tables:

Table No. 1. Initial Ribes eradication on the Clearwater National Forest, 1942.

Table No. 2. Second Ribes eradication on the Clearwater National Forest, 1942.

TABLE NO. 1

INITIAL RIBES ERADICATION ON CLEARWATER NATIONAL FOREST, 1932

Working Unit Number	Type	Acres	Man Days	Number of Ribes Pulled: R. lacustre	R. viscosissimum	R. petiolare	R. inerme	R. irriguum	Total Ribes	Gallons Spray	Total Cost	Per Acre Basis: Man Days	Ribes	Gallons Spray	Cost
1	Open Reproduction	655	952	29,049	832,707	-		-	861,756	-	$ 6,169.85	1.45	1,316	-	$9.42
1	Dense Reproduction	478	75	1,000	15,000	-	-	-	16,000	-	486.07	.16	33	-	1.02
1	Open Mature	727	53	669	41,059	16	-	-	41,744	-	343.49	.07	57	-	.47
1	All Upland Types	1,860	1,080	30,718	888,766	16	-	-	919,500	-	6,999.41	.58	494	-	3.76
2	Open Reproduction	793	627	37,705	68,585	2,152	1,040	62,724	172,206	-	4,063.55	.79	217	-	5.12
2	Dense Reproduction	1,387	147	14,611	13,792	1,663	177	3,955	34,198	-	952.70	.11	25	-	.69
2	Dense Pole	20	3	246	11	-	-	-	257	-	19.44	.15	13	-	.97
2	Open Mature	8,166	527	26,421	22,469	7,592	951	5,966	63,399	-	3,415.45	.06	8	-	.42
2	Dense Mature	426	68	8,832	2,038	471	865	1,980	14,186	-	440.71	.16	33	-	1.03
2	All Upland Types	10,792	1,372	87,815	106,895	11,878	3,033	74,625	284,246	-	8,891.85	.13	26	-	.82
3	Open Reproduction	2,641	2,448	168,650	678,969	22,648	4,619	370	875,256	-	15,865.32	.93	331	-	6.01
3	Dense Reproduction	920	301	24,150	29,886	473	5,549	-	60,058	-	1,950.76	.33	65	-	2.12
3	Open Mature	4,526	252	18,545	48,021	8,970	1,270	-	76,806	-	1,633.20	.06	17	-	.36
3	Dense Mature	18	6	192	431	-	-	-	623	-	38.89	.33	35	-	2.16
3	All Upland Types	8,105	3,007	211,537	757,307	32,091	11,438	370	1,012,743		19,488.17	.37	125	-	2.40
4	Open Reproduction	1,305	1,801	30,512	836,249	601	-	-	867,362	-	11,672.16	1.38	665	-	8.94
4	Dense Reproduction	129	15	500	1,000	-	-	-	1,500	-	97.22	.12	12	-	.75
4	Open Mature	1,554	59	661	7,421	80	-	-	8,162	-	382.38	.04	5	-	.25
4	All Upland Types	2,988	1,875	31,873	844,670	681	-	-	877,224	-	12,151.76	.63	294	-	4.07
4	Stream (hand)	194	177	55,794	8,179	500	-	-	64,473	-	1,147.12	.91	332	-	5.91
4	Stream (chemical)*	68	49	-	-	-	-	-	-	1,127	424.98	.72	-	17	6.25
4	All Stream Type	194	226	55,794	8,179	500	-	-	64,473	1,127	1,572.10	1.16	-	-	8.10
4	All Types	3,182	2,101	87,667	852,849	1,181	-	-	941,697	1,127	13,723.86	.66	296	-	4.31
5	Open Reproduction	705	684	147,386	64,046	1,704	-	-	213,136	-	4,432.96	.97	302	-	6.29
5	Open Pole	143	84	7,538	9,060	12	-	-	16,610	-	544.40	.59	116	-	3.81
5	Open Mature	655	184	42,788	7,480	573	-	-	50,841	-	1,192.49	.28	78	-	1.82
5	All Upland Types	1,503	952	197,712	80,586	2,289	-	-	280,587	-	6,169.85	.63	187	-	4.11
5	Stream (hand)	188	90	31,514	506	350	-	-	32,370	-	583.28	.48	172	-	3.10
5	Stream (chemical)*	11	18	-	-	-	-	-	-	321	148.68	1.64	-	29	13.52
5	All Stream Type	188	108	31,514	506	350	-	-	32,370	321	731.96	.57	-	-	3.89
5	All Types	1,691	1,060	229,226	81,092	2,639	-	-	312,957	321	6,901.81	.63	185	-	4.08
6	Open Reproduction	332	226	29,200	32,716	1,888	-		63,804	-	1,464.69	.68	192	-	4.41
6	Dense Reproduction	719	593	41,117	89,670	11	-	-	130,798		3,843.19	.82	182	-	5.35
6	Open Pole	201	97	38,137	19	629	-	-	38,785	-	628.65	.48	193	-	3.13
6	Dense Pole	713	5	1,552		18	-	-	1,570	-	32.41	.01	2	-	.05
6	Open Mature	1,214	686	60,360	142,852	48	-	-	203,260	-	4,445.02	.57	167	-	3.66
6	All Upland Types	3,179	1,607	170,366	265,257	2,594	-		438,217	-	10,414.86	.51	138	-	3.28
6	Stream (hand)	455	252	79,403	5,187	4,629	-	-	89,219	-	1,633.20	.55	196	-	3.59
6	Stream (chemical)*	552	660	-	-	-	-		-	35,702	7,363.70	1.20	-	65	13.34
6	All Stream Type	552	912	79,403	5,187	4,629	-	-	89,219	35,702	8,996.90	1.65	-	-	16.30
6	All Types	3,731	2,519	249,769	270,444	7,223	-	-	527,436	35,702	19,411.76	.68	141	-	5.20
7	Open Reproduction	1,016	1,889	46,789	1,302,628	702	8,241		1,358,360	-	12,242.48	1.86	1,337	-	12.05
7	Open Pole	351	114	3,535	30,508	-	-	-	34,043	-	738.83	.32	97	-	2.11
7	Open Mature	14	25	1,640	16,252	85	16	-	17,993	-	162.02	1.79	1,285	-	11.57
7	All Upland Types	1,381	2,028	51,964	1,349,388	787	8,257	-	1,410,396	-	13,143.33	1.47	1,021	-	9.52
8	Open Reproduction	1,061	1,130	135,574	364,295	-	-	-	499,869	-	7,323.45	1.07	471	-	6.90
9	Open Mature	54	42	-	21,600				21,600	-	272.20	.78	400	-	5.04
11	Open Reproduction	920	914	30,928	278,361	757	-		310,046	-	5,923.57	.99	337	-	6.44
11	Open Pole	70	22	3,953	871	-		-	4,824	-	142.58	.31	69	-	2.04
11	Dense Pole	62	4	40	100	-	-	-	140	-	25.92	.06	2	-	.42
11	Open Mature	9,909	2,088	611,911	95,649	6,277	-	-	713,837	-	13,532.19	.21	72	-	1.37
11	Dense Mature	140	2	14	4	-	-	-	18	-	12.96	.01	-1	-	.09
11	Brush	267	40	1,959	625	57	-	-	2,641	-	259.24	.15	10	-	.97
11	All Upland Types	11,368	3,070	648,805	375,610	7,091	-	-	1,031,506	-	19,896.46	.27	91	-	1.75
11	Stream (hand)	1,881	1,040	335,714	2,260	6,685	-	-	344,659	-	6,740.17	.55	183	-	3.58
11	Stream (chemical)*	16	78	-	-	-	-	-	-	1,397	644.78	4.88	-	87	40.30
11	All Stream Type	1,881	1,118	335,714	2,260	6,685	-	-	344,659	1,397	7,384.95	.59	-	-	3.93
11	All Types	13,249	4,188	984,519	377,870	13,776	-	-	1,376,165	1,397	27,281.41	.32	104	-	2.06
13	Open Reproduction	266	128	2,439	82,383	11	-	-	84,833	-	829.56	.48	319	-	3.12
13	Open Mature	4,545	951	87,040	88,692	1,468	157	4,876	182,233	-	6,163.37	.21	40	-	1.36
13	Brush	184	97	19,881	2,747	466	-	-	23,094	-	628.65	.53	126	-	3.42
13	All Upland Types	4,995	1,176	109,360	173,822	1,945	157	4,876	290,160	-	7,621.58	.24	58	-	1.53
13	Stream (hand)	423	194	53,276	1,409	10,496	378	21	65,580	-	1,257.30	.46	155	-	2.97
13	Stream (chemical)*	4	19	-	-	-	-	-	-	201	145.93	4.75	-	50	36.48
13	All Stream Type	423	213	53,276	1,409	10,496	378	21	65,580	201	1,403.23	.50	-	-	3.32
13	All Types	5,418	1,389	162,636	175,231	12,441	535	4,897	355,740	201	9,024.81	.26	66	-	1.67
All Units	Open Reproduction	9,694	10,799	658,232	4,540,939	30,463	13,900	63,094	5,306,628	-	69,987.59	1.11	547	-	7.22
All Units	Dense Reproduction	3,633	1,131	81,378	149,348	2,147	5,726	3,955	242,554	-	7,329.94	.31	67	-	2.02
All Units	Open Pole	765	317	53,163	40,458	641	-	-	94,262	-	2,054.46	.41	123	-	2.69
All Units	Dense Pole	795	12	1,838	111	18	-	-	1,967	-	77.77	.02	2	-	.10
All Units	Open Mature	31,364	4,867	850,235	491,495	25,109	2,394	10,842	1,380,075	-	31,542.71	.16	44	-	1.01
All Units	Dense Mature	584	76	9,038	2,473	471	865	1,980	14,827	-	492.56	.13	25	-	.84
All Units	Brush	451	137	21,840	3,372	523	-	-	25,735	-	887.89	.30	57	-	1.97
All Units	All Upland Types	47,286	17,339	1,675,724	5,228,196	59,372	22,885	79,871	7,066,048	-	112,372.92	.37	149	-	2.38
All Units	Stream (hand)	3,141	1,753	555,701	17,541	22,660	378	21	596,301	-	11,361.07	.56	190	-	3.62
All Units	Stream (chemical)*	651	824	-	-	-	-	-	-	38,748	8,728.07	1.27	-	60	13.41
All Units	All Stream Type	3,238	2,577	555,701	17,541	22,660	378	21	596,301	38,748	20,089.14	.80	-	-	6.20
All Units	All Types	50,524	19,916	2,231,425	5,245,737	82,032	23,263	79,892	7,662,349	38,748	$132,462.06	.39	152	-	$2.62

*Acres in stream type worked by both hand and chemical methods are included only once in totals.

Annual Report 1932
H. E. Swanson

TABLE NO. 2

SECOND RIBES ERADICATION ON CLEARWATER NATIONAL FOREST, 1932

Working Unit No.	Type	Acres	Man Days	Number of Ribes Pulled: R. inc.	R. vis.	R. pet.	R. iner.	Total Ribes	No. Gals. Spray	Total Cost	Per Acre Basis: Man Days	Ribes	Gals. Spray	Cost
1	Str. (hand)	175	112	30,905	8,442	1,441	-	40,788	-	$725.85	.64	233	-	4.15
	Str. (hand)	395	360	43,453	1,676	33,980	20,866	99,975	-	2,333.14	.91	253	-	5.91
	Str.* (chem.)	14	9	-	-	-	-	-	146	73.21	.64	-	10	5.23
2	All stream	396	369	43,453	1,676	33,980	20,866	99,975	146	2,406.35	.93	-	-	6.08
	Str. (hand)	1,302	260	43,395	5,089	28,033	6,091	82,508	-	1,685.04	.20	63	-	1.29
	Str.* (chem.)	745	33	-	-	-	-	-	783	288.52	.04	-	1	.39
3	All stream	1,302	293	43,395	5,089	28,033	6,091	82,508	783	1,973.56	.23	-	-	1.52
	Str. (hand)	71	19	3,003	316	322	-	3,641	-	123.14	.27	51	-	1.73
	Str.* (chem.)	19	16	-	-	-	-	-	221	127.02	.84	-	12	6.69
4	All stream	71	35	3,003	316	322	-	3,641	221	250.16	.49	-	-	3.52
5	Str.* (chem.)	29	10	-	-	-	-	-	238	155.72	.64	-	8	5.37
	Str. (hand)	10	14	1,351	4	-	-	1,355	-	90.73	1.40	136	-	9.07
	Str.* (chem.)	94	131	-	-	-	-	-	2,536	1,097.24	1.39	-	27	11.67
6	All stream	104	145	1,351	4	-	-	1,355	2,536	1,187.97	1.39	-	-	11.42
	Str. (hand)	47	141	29,306	566	199	25,706	55,777	-	913.81	3.00	1,187	-	19.44
	Str.* (chem.)	66	75	-	-	-	-	-	1,097	600.29	1.16	-	17	9.24
7	All stream	113	216	29,306	566	199	25,706	55,777	1,097	1,514.10	1.93	-	-	13.52
	Str. (hand)	16	9	2,130	530	-	-	2,660	-	58.34	.56	166	-	3.65
	Str.* (chem.)	16	8	-	-	-	-	-	75	60.67	.50	-	5	3.79
8	All stream	16	17	2,130	530	-	-	2,660	75	119.01	1.06	-	-	7.44
	Str. (hand)	2,016	915	153,433	16,623	63,975	52,663	286,694	-	5,930.05	.45	142	-	2.94
All	Str.* (chem.)	933	292	-	-	-	-	-	5,031	2,402.67	.30	-	5	2.45
Units	All stream	2,204	1,207	153,433	16,623	63,975	52,663	286,694	5,031	$8,332.72	.55	-	-	$3.78

*Acres in stream type worked by both hand and chemical methods are included only once in totals.

CHECKING AFTER RIBES ERADICATION
CLEARWATER NATIONAL FOREST

By
E. L. Joy
Junior Forester

On the Clearwater National Forest a total of 41,758.6 acres eradicated of Ribes was checked in 1932. Of this total 34,170 acres were worked in 1932 and 6,914.6 acres in 1931. The balance, 674 acres, is in an unworked block designated as supporting less than 50 feet of live stem per acre. In neither case does the acreage checked total the acreage eradicated of Ribes.

The 1932 worked areas that were checked were distributed among 19 camps. In Table No. 1 the Ribes per acre after eradication are shown by type for each camp.

TABLE NO. 1

RIBES PER ACRE AFTER ERADICATION IN 1932

Camp	Type	Per Cent Check	R. petiolare Bushes	R. petiolare Feet Live Stem	R. inerme Bushes	R. inerme Feet Live Stem	R. lacustre Bushes	R. lacustre Feet Live Stem	R. viscosissimum Bushes	R. viscosissimum Feet Live Stem	R. irriguum Bushes	R. irriguum Feet Live Stem	All Species Bushes	All Species Feet Live Stem
1	Open Mature	2.0					1	9					1	9
	Stream	2.0	11	71			23	123					34	[illegible]
	All Types	2.0	1	3			1	13					[illegible]	[illegible]
2	Open Reproduction	4.1					1	3	32	141			33	144
	Dense Reproduction	6.8											[illegible]	0
	Open Pole	6.4					1	8	18	63			19	71
	Dense Pole	8.0							1	3			1	3
	Open Mature	2.3	N	1			2	13	N	2			[illegible]	16
	Dense Mature	2.0					N	1					N	1
	Brush	8.0							55	210			[illegible]	[illegible]
	Meadow	8.0											0	0
	Stream	3.2	7	48			12	83					19	131
	All Types	2.5	N	2			2	14	5	20			7	36
3	Open Reproduction	2.0					3	18	14	88	1	8	18	114
	Dense Reproduction	2.0					N	N	1	2			1	2
	Open Pole	2.0							2	8	4	122	6	137
	Dense Pole	2.0							1	4			1	4
	Open Mature	2.0					1	21	N	1	N	9	1	31
	Dense Mature	2.0					N	1	N	N			N	[illegible]
	Brush	2.0							22	837	10	474	32	1,311
	Barren	2.0									2	3	2	3
	Meadow	2.0					6	20					6	20
	Stream	2.0	10	113	9	85	9	61					28	[illegible]
	All Types	2.0	1	4	N	3	1	16	1	13	1	14	4	[illegible]
4	Open Reproduction	2.0					6	35	4	52			10	87
	Open Pole	2.0					1	6	8	40			9	46
	Dense Pole	2.0								-			0	0
	Open Mature	2.1					2	22	1	6			3	[illegible]
	Dense Mature	2.0											0	0
	Brush	2.0							21	134			21	134
	Burn	2.0							13	18			18	18
	Meadow	2.1											0	0
	Stream	2.1	17	114			13	75					30	[illegible]
	All Types	2.1	1	7			3	24	1	10			5	41
5	Open Reproduction	6.2					1	4	11	36			12	40
	Dense Reproduction	8.0											0	0
	Open Pole	8.0											0	0
	Dense Pole	8.0											0	0
	Open Mature	8.0					N	2	1	1			1	3
	Dense Mature	8.0											0	0
	Brush	7.1							11	30			11	30
	Stream	7.8	5	17									5	17
	All Types	7.5	N	1			N	1	5	14			5	16
6	Open Reproduction	2.6					2	8	17	81			19	89
	Dense Reproduction	2.2					1	2	2	34			3	36
	Open Pole	2.0							1	3			1	3
	Dense Pole	2.1							2	11			2	11
	Open Mature	2.2					6	36	2	22			8	58
	Dense Mature	2.2					1	1	N	1			1	2
	Brush	2.0					1	3	1	1			2	4
	Stream	2.2	5	149			17	74	2	15			24	238
	All Types	2.2	N	5			3	19	5	32			8	56
7	Open Reproduction	4.0					1	3	16	66			17	69
	Open Pole	4.0					1	2	20	40			21	42
	Open Mature	4.0					2	3	6	18			8	21
	Brush	4.0					3	7	13	47			16	54
	Stream	4.0					8	36					8	36
	All Types	4.0					2	6	12	41			14	47
9	Stream	4.0	8	118			19	218					27	336
10	Open Pole	2.0					2	3	64	62			66	65
	Brush	2.0							34	32			34	32
	Stream	3.7	11	35			13	60	3	21			27	116
	All Types	2.3	3	10			5	18	44	48			52	76
11	Open Reproduction	2.0							75	102			75	102
	Open Pole	2.0					1	11	9	40			10	51
	Brush	2.0					1	1	20	89			21	90
	Stream	2.0					6	61					6	61
	All Types	2.0					1	9	17	62			18	71

N - Negligible or less than 0.5.
Checkers included variations in types not recognized in Ribes eradication records.

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E. L. Joy

(CONTINUED)

TABLE NO. 1 (CONTINUED)

RIBES PER ACRE AFTER ERADICATION IN 1932

Camp	Type	Per Cent Check	Ribes Per Acre after Eradication											
			R. petiolare		R. inerme		R. lacustre		R. viscosissimum		R. irriguum		All Species	
			Bushes	Feet Live Stem	Bushes	Feet Live Stem	Bushes	Feet Live Stem	Bushes	Feet Live Stem	Bushes	Feet Live Stem	Bushes	Feet Live Stem
12	Dense Reproduction	2.0					4	13	5	20			9	38
	Open Pole	2.0					1	13	2	12			3	25
	Dense Pole	2.0					1	4	1	1			2	5
	Stream	2.0					3	3					3	3
	All Types	2.0					2	13	3	12			5	25
13	Open Mature	2.0					5	30	5	16			10	46
	Brush	2.0							2	4			2	4
	Stream	2.0					23	209					23	209
	All Types	2.0					5	30	5	15			10	45
14	Open Reproduction	2.0					17	40	30	81			47	121
	Open Mature	2.0					45	168	6	15			51	183
	Stream	2.0					86	209	3	7			89	216
	All Types	2.0					29	78	23	63			52	141
15	Open Reproduction	2.0							3	21			3	21
	Dense Reproduction	2.0											0	0
	Open Pole	2.0							1	14			1	14
	Dense Pole	2.0											0	0
	Open Mature	2.0					1	8	4	56			5	64
	Dense Mature	2.0					1	17	1	13			2	30
	Stream	2.0	1	29					2	37			3	66
	All Types	2.0	N	1			N	8	3	36			3	45
16	Open Reproduction	2.0							17	233			17	233
	Dense Reproduction	2.0					6	53	6	53			12	106
	Open Mature	2.0					9	35	2	8			11	43
	Stream	2.0					33	152					33	152
	All Types	2.0					10	43	2	10			12	53
17	Open Reproduction	2.0					2	17	6	60			8	77
	Open Pole	2.0											0	0
	Open Mature	2.0					1	9	1	5			2	14
	Dense Mature	2.0					N	1	N	1			N	2
	Stream	2.0	N	N			5	32	1	11			6	43
	All Types	2.0	N	N			1	9	1	7			2	16
18	Open Reproduction	2.0							2	24			2	24
	Open Mature	2.2			N	N	3	35	1	6			4	41
	Dense Mature	2.3					N	N					N	N
	Stream	2.2					4	22	N	3			4	25
	All Types	2.2			N	N	3	31	1	6			4	37
19	Open Reproduction	2.0					1	15	5	101			6	116
	Open Mature	2.0					3	60	2	47			5	107
	Dense Mature	2.0											0	0
	Brush	2.0											0	0
	Stream	2.0					17	126					17	126
	All Types	2.0					4	56	2	50			6	106
20	Open Reproduction	2.0							133	988			133	988
	Open Mature	2.0			N	1	1	10	1	10	N	1	2	22
	Dense Mature	2.0											0	0
	Brush	2.0					31	588					31	588
	Barren	2.0											0	0
	Stream	2.0	1	6			13	194					14	200
	All Types	2.0	N	N	N	1	2	23	2	17	N	1	4	42
All Camps	Open Reproduction	2.7					3	13	20	91	N	1	23	105
	Dense Reproduction	2.6					1	4	2	19			3	23
	Open Pole	2.2					1	6	11	28	N	16	12	50
	Dense Pole	2.7					N	1	1	3			1	4
	Open Mature	2.1	N	N	N	N	2	21	1	8	N	2	3	31
	Dense Mature	2.1					N	2	N	1			N	3
	Brush	3.4					1	6	15	76	N	16	16	98
	Barren	2.0									1	2	1	2
	Burn	2.0							18	18			18	18
	Meadow	2.1					2	8					2	8
	Stream	2.4	6	61	1	8	14	104	N	3			21	176
	All Types	2.3	N	3	N	1	3	21	4	18	N	2	7	45

N - Negligible or less than 0.5.
Checkers included variations in types not recognized in Ribes eradication records.

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From Table No. 1 was derived the percentage of acreage in stream type, upland types and all types that had not over 100, 50 and 25 feet of Ribes live stem per acre. These data are shown in Table No. 2.

TABLE NO. 2

ACRES GROUPED ACCORDING TO
AMOUNT OF LIVE STEM AFTER ERADICATION

Type	Percentage of Acreage Supporting Ribes Live Stem Per Acre Not Exceeding		
	100 Feet	50 Feet	25 Feet
Stream	22.0	15.4	7.2
Upland	93.5	91.3	51.1
All Types	89.3	78.7	48.3

It is apparent from Table No. 2 that although a large percentage of the upland acreage has not to exceed 50 feet of Ribes live stem per acre, most of the stream type area supports over 100 feet.

TABLE NO. 3

RIBES PER ACRE IN 1932 ON THE ACREAGE WORKED IN 1931

Drainage	Area	Type	Per Cent Check	Ribes Per Acre after Eradication: R. petiolare Bushes	R. petiolare Feet Live Stem	R. inerme Bushes	R. inerme Feet Live Stem	R. lacustre Bushes	R. lacustre Feet Live Stem	R. viscosissimum Bushes	R. viscosissimum Feet Live Stem	All Species Bushes	All Species Feet Live Stem
North Fork of the Clearwater River	Bar, Larson and Unnamed Tributaries	Stream	2.0							1	2	1	2
	Sneak and Sheen Creeks	Stream	2.0					13	530			13	530
		All Types	2.0					7	228	N	1	7	272
Orofino Creek	Totals Rosebud Creek and Tributaries	Stream	4.0	13	25			24	113	N	8	37	221
Orogrande Creek	Sawmill Creek	Open Mature	2.0					1	8	15	94	16	102
		Brush	2.0							6	31	6	31
		Stream	2.0					50	1,006			50	1,006
		All Types	2.0					3	54	14	87	17	141
Washington Creek	Tumble Creek	Open Reproduction	2.0					54	388	119	977	174	1,365
		Open Mature	2.0							100	471	100	471
		Dense Mature	2.0									0	0
		Stream	2.0	6	63	1	1	35	224	1	27	43	316
	Turkey Creek	Stream	2.0					80	220			80	220
	Misplaced Creek	Stream	2.0					81	658			81	658
	Washington, and Unnamed Tributaries	Stream	2.0	27	60			43	324			70	384
		All Types	2.0	2	43	N	N	43	238	20	160	72	491
Weitas Creek	Halfway Creek	Open Mature	1.0					2	93	25	392	27	485
		Brush	1.0					3	43	59	1,903	62	1,946
		Stream	1.0					100	1,000			100	1,000
	Bighorn Creek	Open Mature	1.0					5	164	54	565	59	729
		Brush	1.0	N	2			2	124	77	1,077	80	1,203
		Stream	1.0	37	350			53	3,165			90	3,515
	Doris and Weitas Creeks	Open Mature	2.0			1	7	1	96	111	1,368	113	1,471
		Brush	2.0			N	1	2	16	92	1,283	94	1,299
		Stream	2.9	13	757	159	16,442	4	133			176	17,332
		All Types	1.4	1	30	6	573	3	112	79	1,115	89	1,830
French Creek	Rhine Creek	Stream	4.0	7	433			25	249			32	682
	Elk Creek	Stream	4.0	2	41			34	684			36	725
		All Types	1.4	4	171			31	540			35	711
Lolo Creek	Camp Creek	Open Reproduction	4.0					19	260	84	643	103	903
		Open Pole	4.0					14	275	6	29	20	304
		Open Mature	4.0					22	269	4	56	26	325
		Dense Mature	4.0									0	0
		Brush	4.0					83	2,049	47	413	130	2,462
		Sub-Alpine	4.0					17	1,061	2	29	19	1,090
		Stream	4.0	8	83			53	407			61	490
	Dutchman and Black Creeks	Open Reproduction	4.0					10	70	65	315	75	385
		Stream	4.0									0	0
		All Types	4.0	1	6			26	399	9	89	36	494
	All Areas	Open Reproduction	3.7					22	266	86	663	108	929
		Open Pole	4.0					14	275	6	29	20	304
		Open Mature	3.1			N	1	19	242	15	178	34	421
		Dense Mature	3.7									0	0
		Brush	1.7	N	N	N	N	19	480	76	1,105	95	1,585
		Sub-Alpine	4.0					17	1,061	2	29	19	1,090
		Stream	3.2	7	139	8	793	37	431	N	3	52	1,366
		All Types	2.8	1	31	1	119	22	333	23	298	47	771

N - Negligible or less than 0.5.

Checkers included variations in types not recognized in Ribes eradication records.

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E. L. Joy

In Table No. 3 the Ribes per acre one year after eradication are shown, by type, for each area checked. The percentages of the acreage in stream type, upland types and all types, that fell within the 100, 50 and 25 feet of Ribes live stem per acre classes are shown in Table No. 4.

TABLE NO. 4

ACRES GROUPED ACCORDING TO AMOUNT OF LIVE STEM AFTER ERADICATION IN 1931

Type	Percentage of Acreage Supporting Ribes Live Stem Per Acre Not Exceeding		
	100 Feet	50 Feet	25 Feet
Stream	4.6	4.6	4.6
Upland	0.6	0.6	0.5
All Types	1.2	1.2	1.0

From Tables No. 3 and 4 it is evident that only a very small portion of the 1931 worked acreage on the Clearwater National Forest supported less than 50 or even less than 100 feet of live stem per acre one year after eradication.

Within the area assigned to camp 12, one block consisting of 674 acres, was estimated to have not over 50 feet of Ribes live stem per acre. A check of this area showed the occurrence of Ribes per acre as follows:

TABLE NO. 5

RIBES PER ACRE ON CAMP 12 AREA ESTIMATED TO SUPPORT NOT OVER 50 FEET OF LIVE STEM PER ACRE. 2 PER CENT CHECK

Type	Ribes Per Acre After Eradication							
	R. petiolare		R. lacustre		R. viscosissimum		All Species	
	Bu.	F.L.S.	Bu.	F.L.S.	Bu.	F.L.S.	Bu.	F.L.S.
Open Reproduction			13	113	N	N	13	113
Dense Reproduction			25	217	25	191	50	408
Dense Pole			6	102	N	2	6	104
Stream	2	10	45	824			47	834
All Types	N	1	12	188	1	8	13	197

N = negligible or less than 0.5

Although Table No. 5 shows the average Ribes abundance over the entire acreage, the report on this area states that most of the Ribes occur around the heads of all the small streams. It is planned that this area will be worked in 1936.

Costs

Checking cost computations for the Clearwater National Forest are as follows:

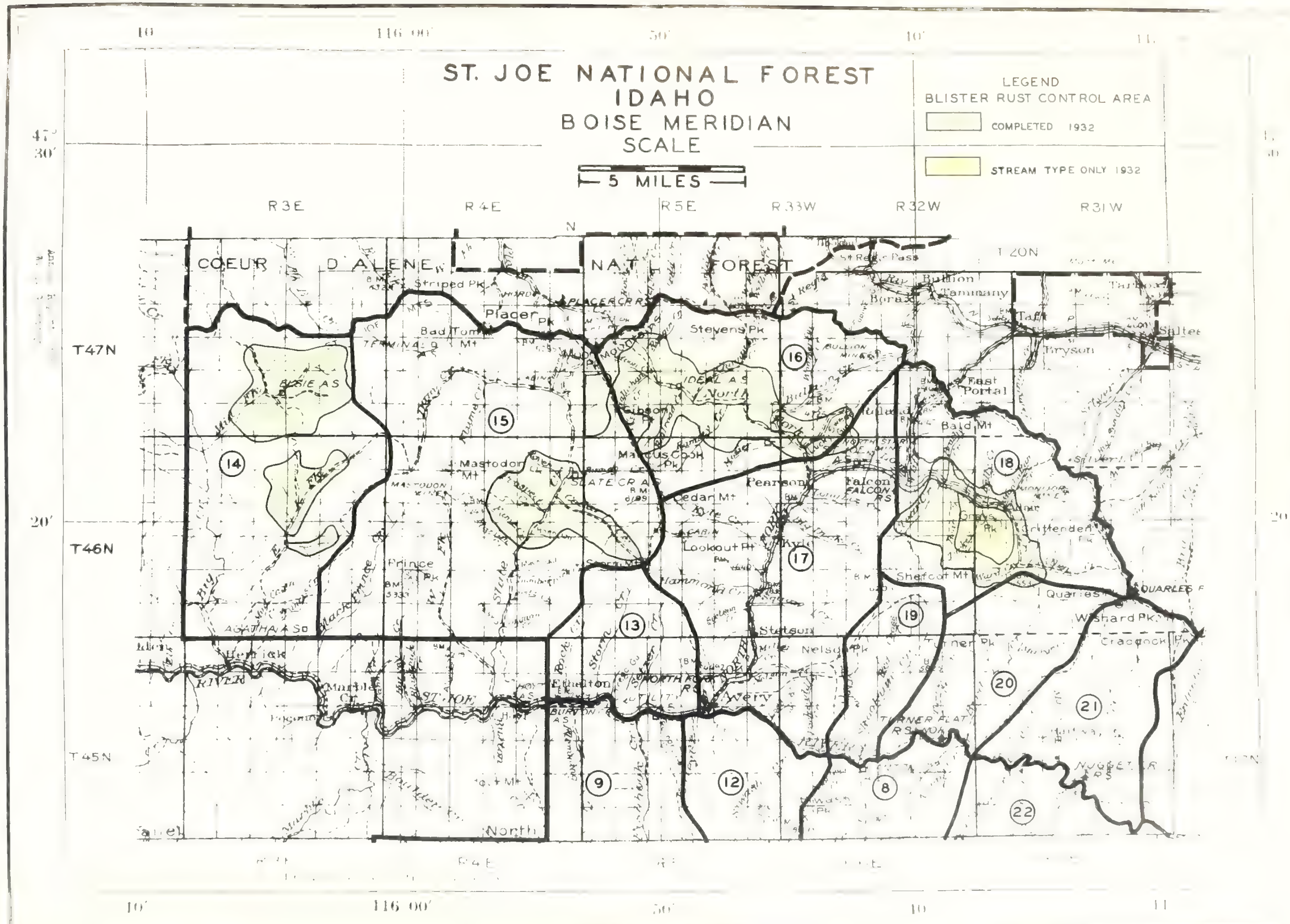
Cost of checking..........$2,845.16

Acres checked.............41,758.7

Average cost per acre for
checking. $\frac{\$2,845.16}{41,758.7}$ .... $.068

Annual Report 1932
W. G. Guernsey

A. 17. Looking north on the Loop Creek drainage, St. Joe National Forest. Boundaries of Ribes eradication are marked by line. Picture by 116th Photo Section.


ST. JOE NATIONAL FOREST
IDAHO
BOISE MERIDIAN
SCALE
5 MILES
LEGEND
BLISTER RUST CONTROL AREA
COMPLETED 1932
STREAM TYPE ONLY 1932
R3E
R4E
R5E
R33W
R32W
R31W
T47N
T46N
T45N
T20N
COEUR D'ALENE NAT'L FOREST
Striped Pk
Placer Pk
Bad Tom Mt
Stevens Pk
Mastodon Mt
Prince Pk
Pearson
Cedar Mt
Lookout Pt
Kyle
Falcon
FALCON RS
Bald Mt
East Portal
Bryson
Bullion
Tammany
Borax
Taft
St Regis Pass
Grays Pk
Crittenden
Shefcot Mt
Quarles
QUARLES
Wishard Pk
Cradock Pk
Nelson Pk
Stetson
Ethelton
Weiry
Marble Cr
Herrick
ST. JOE RIVER
TURNER FLAT RS
Boulder Cr
North
14
15
16
17
18
19
20
21
22
8
9
12
13
116°00′
50′
10′
20′
47° 30′

RIBES ERADICATION ON THE ST. JOE NATIONAL FOREST

By
W. G. Guernsey, Junior Forester,
Division of Blister Rust Control,
Neil Fullerton, Junior Forester
Forest Service

Ribes eradication for the control of white pine blister rust on the St. Joe National Forest was started during 1932. This work was carried on by the Forest Service and Division of Blister Rust Control, as part of an intensive program to protect our commercial white pine from blister rust.

LOCATION AND DESCRIPTION OF AREA

Work in 1932 was confined to selected portions of the Big Creek, Slate Creek, Little North Fork of the St. Joe River and Loop Creek drainages. All these drainages are located in the northern part of the St. Joe Forest and the Little North Fork of St. Joe River and Loop Creek drainages join the Idaho-Montana boundary on the east. A map accompanying this report gives the exact location and extent of all areas worked.

A large part of the area has been burned over several times. Those areas burned once had a heavy growth of brush and Ribes. The areas burned over more than once, especially in the Slate Creek drainage, were fairly free from any concentration of either brush or Ribes.

The majority of the white pine area worked has been planted during the last eighteen years. There has been a fair return of natural white pine reproduction in the areas protected along Loop Creek. The locality surrounding the Loop Creek protected area has a heavy stand of young lodgepole pine.

Ribes lacustre and *R. viscosissimum* were distributed over the entire area. *R. inerme* was found in the stream type along the Little North Fork of the St. Joe River and the Middle Fork of Big Creek. *R. petiolare* was found in the stream type of working units 16 and 18 and to a limited extent in the stream type of working units 14 and 15.

ORGANIZATION AND PERSONNEL

A forest officer of the St. Joe National Forest was in charge of the project. His responsibility and duties were mainly those pertaining to organization and maintenance of camps. A project leader from the Division of Blister Rust Control, whose responsibility and duties pertained chiefly to technical supervision of the work in the field, worked in cooperation with the forest officer in charge. The four unit supervisors and nine of the thirteen camp bosses were temporary men having previous experience with the Division of Blister Rust Control. The four temporary

camp bosses not having previous Ribes eradication experience were former trail crew foremen on the St. Joe Forest with years of experience handling men. The 12 camps had an average of 25 men per camp and these temporary men were fairly satisfactory. The men with former eradication experience and men who worked for the Forest Service in previous years were above the average for conscientious effort.

STATEMENT OF EXPENDITURES

I. Expenditures by appropriations

Last half fiscal year 1932:

A. Forest Service blister rust appropriation	$27,536.30
B. Division of Blister Rust Control appropriation	2,377.26
Total	$29,913.56

First half fiscal year 1933:

A. Forest Service blister rust appropriation	$66,090.46
B. Division of Blister Rust Control appropriation	6,364.28
Total	$72,454.74

Total, both fiscal years $102,368.30

II. Classified Expenditures, calendar year 1932

A. Salaries		$10,103.12
B. Wages, temporary labor		57,707.76
C. Travel and transportation		4,344.04
D. Subsistence supplies		18,736.59
E. Supplies and equipment -		
1. Camp equipment	$4,674.12	
2. Rental of equipment	1,485.00	
3. Other supplies	5,331.65	
	$11,490.77	11,490.77
		$102,363.29

III. Activity costs:

A. Supervision -		
1. Direct project supervision	$9,371.75	
a. Checking	1,222.51	
2. Overhead service of supplies	1,014.54	
3. Overhead office work	999.32	
Total	$12,608.12	$12,608.12

camp bosses not having previous [illegible] were former trail crew foremen on the St. Jo. Forest with gangs of [illegible] men. The 15 camps had an average of 30 men per camp. [illegible] men were fairly satisfactory. The men with former [illegible] and men who worked for the Forest Service in previous years were above the average for conscientious effort.

[illegible]

I. Expenditures by appropriations

Last half fiscal year 1933:

a. [illegible]
b. Division of Blister Rust Control appropriation ..... [illegible]
Total..... [illegible]

[illegible] fiscal year 1934

a. Forest Service blister rust appropriation..... [illegible]
b. [illegible]
Total

Total, [illegible] ..... [illegible]

II. Classified expenditures [illegible]

a. Salaries..... [illegible]
b. [illegible]
c. Travel and transportation [illegible]
d. [illegible]
e. Supplies and equipment -
1. Camp equipment..... [illegible]
2. Rental of equipment..... 1,[illegible]
3. Other supplies..... [illegible]
[illegible]
[illegible]

III. [illegible]

a. Supervision -
1. Direct project supervision..... [illegible]
a. Checking..... 1,[illegible]
2. Overhead service of supplies..... 1,[illegible]
3. Overhead office work..... [illegible]
Total..... [illegible]

Brought forward..$12,698.12

B. Travel... 423.81

C. Transportation -
   1. Freight and express..................$512.81
   2. Truck.................................. 974.71
   3. Pack..................................2,336.62
      Total.................................$3,824.14........ 3,824.14

D. Equipment -
   1. Rental and depreciation of equipment
      a. Depreciated camp equipment..$2,236.54
      b. Depreciated chemical equipment......................... 112.33
      c. Rentals (Spokane warehouse) 1,485.50
         Total.............................$3,834.37....... 3,834.37

E. Eradication supplies -
   1. Chemicals.............................$2,363.25
   2. Glue..................................... 35.40
   3. Twine.................................... 580.01
      Total.................................$2,978.66....... 2,978.66

F. Camps -
   1. Camp..................................$1,988.12
   2. Trail construction..................... 269.31
   3. Telephone communication................ 62.44
      Total.................................$2,319.88....... 2,319.88

G. Hand eradication .... 67,[illegible]87.95

H. Chemical eradication.................................... 4,917.[illegible]

I. Preeradication, fall 1931.................................. [illegible]1.14
   Project total costs.................................... $[illegible]9,77[illegible].79

Subsistence total..........................$18,733.59
Subsistence per man day........................ .9[illegible]
Chemical supplies used 1932 -
   a. Chemical cost........................ 2,363.25
   b. Chemical transportation.............. 321.84
   c. Glue................................. 35.40
      Total................................ $2,720.49

Maintenance, waste and repairs to equipment
   to be charged to 1933 blister rust
   project.
   a. Camp equipment........................ $182.62
   b. Eradication equipment................. 30.94
      Total................................. $213.56

Supplies on hand for 1933 season:

a.	Chemical (at Avery, Idaho)	$1,058.50
b.	Equipment (residual value)	3,794.58
c.	Twine	70.99
	Total	$4,924.07

Explanation of Activity Costs, 1932

A. Supervision -

1. Direct project supervision includes salaries of Fullerton, Guernsey, unit supervisors and camp bosses for time engaged in active field work.

2. Overhead service of supplies includes salaries of men engaged at warehouses in Avery and Calder, Idaho.

3. Overhead office work includes contributed time, Fullerton's and Guernsey's salaries and a portion of stenographer's time.

B. Travel -

Includes expense accounts of Fullerton and Guernsey and operating costs of blister rust Ford used on project.

C. Transportation -

1. Freight and express includes cost of transporting by rail all equipment, food supplies, chemical and other supplies for the project.

2. Truck: Transportation by truck includes rental of Chevrolet truck, driver hire, gas and oil and a small amount for parts.

3. Pack: Forest Service rental of pack string, salaries of packers, blacksmith, forage, shoes and contributed packing time paid for, are all included in this item.

D. Equipment -

1. Depreciated camp equipment. This figure includes 1/2 of the $1,337.00 Beaverhead equipment (which has been partly depreciated), 1/3 of the $4,674.12 new equipment, and $112.53 or 1/2 cost of chemical equipment received from Clearwater National Forest.

Rental of equipment figure is total paid for equipment rented from Spokane warehouse.

E. Chemicals -

These items are the costs of the amounts used on the job.

F. Camps -

1. Camps: Prorated wages and subsistence on an effective man day basis for cutting wood, and setting up and taking down camps.

2. Trails: Same basis as above for cutting new trails and maintaining established trails in passable condition.

3. Telephones: Same basis as above for stringing emergency line and setting up telephones and maintenance of same.

G. Hand eradication -
Proration of wages and subsistence on effective man-day basis.

H. Chemical eradication - Same as hand eradication.

I. Subsistence -
Total food supplies and cook house labor and no transportation costs are included in the subsistence total.

The activity costs are not equal to the actual expenditures because the camp equipment is depreciated on a 3-year basis. There was no actual expense for chemical equipment and the total amount of chemicals paid for was not all used.

IV. Statement of the composite cost per effective man day:

Total cost of operation . . . . $[illegible]
Minus cost chemical equipment, repairs, fuel and
transportation of chemical . . . . [illegible]
$97,065.30

Hand pulling cost per man day $97,065.30 / 18,[illegible] = $5.1946

Chemical and spraying equipment cost $[illegible] / 1,280.7 = $[illegible]

$5.1946 + $[illegible] = $7.[illegible], cost per chemical spraying day.

RESULTS OF RIBES ERADICATION OPERATIONS

The results of Ribes eradication operations are presented in the following table:

TABLE NO. 1

INITIAL RIBES ERADICATION ON ST. JOE NATIONAL FOREST

Working Unit No.	Type	Acres	Man Days	Number of Ribes Pulled: R. lacustre	R. viscosissimum	R. petiolare	R. inerme	R. irriguum	Total Ribes	Gallons Spray	Total Cost	Per Acre Basis: Man Days	Ribes	Gallons Spray	Cost
14	Open Reproduction	4,208	3,811.9	135,769	908,365	[illegible]	489	933	1,050,431		$19,801.29	.91	250		$4.70
	Brush	750	823.7	42,348	204,017	1,723	1,367		249,455		4,278.79	1.10	333		5.70
	All Upland Types	4,958	4,635.6	178,117	1,112,983	5,995	1,856	933	1,299,886		24,080.08	.93	262		4.86
	Stream (Hand)	765	842.4	54,759	115,820	15,569	5,324	893	192,365		4,375.93	1.10	251		5.72
	Stream (Chemical)*	122	94.0							1,724	691.14	.77		14	5.66
	All Stream Types	765	936.4	54,759	115,820	15,569	5,324	893	192,365		5,067.07	1.22	251		6.62
	All Types	5,723	5,572.0	232,876	1,228,805	21,564	7,180	1,826	1,492,251		$29,147.15	.97	261		$5.09
15	Open Reproduction	4,734	2,014.3	36,789	502,147	296	12	516	539,760		$10,463.48	.43	114		$2.21
	Dense Reproduction	161	30.0	31	4,340				4,371		155.84	.19	27		.97
	Brush	776	432.9	10,296	106,205	241			116,742		2,248.74	.56	150		2.90
	All Upland Types	5,671	2,477.2	47,116	612,692	537	12	516	660,873		12,868.06	.44	116		2.27
	Stream (Hand)	832	540.6	68,953	43,943	7,496	4,589	92	125,073		2,808.20	.65	150		3.37
	Stream (Chemical)*	38	35.0							620	257.34	.92		16	6.77
	All Stream Types	832	575.6	68,953	43,943	7,496	4,589	92	125,073		3,065.54	.69	150		3.68
	All Types	6,503	3,052.8	116,069	656,635	8,033	4,601	608	785,946		$15,933.60	.47	121		$2.45
16	Open Reproduction	4,785	3,065.3	313,884	527,751	3,160	6,028	14	850,837		15,926.01	.64	178		3.33
	Dense Reproduction	51	27.0	2,431	4,443			35	6,909		140.25	.53	136		2.75
	Brush	476	356.9	20,668	73,266	23	55		94,022		1,853.95	.75	197		3.89
	All Upland Types	5,312	3,449.2	336,983	605,460	3,183	6,093	49	951,768		17,917.21	.65	179		3.37
	Stream (Hand)	1,204	1,435.5	298,226	43,506	7,446	92,362	8	441,548		7,456.84	1.19	367		6.19
	Stream (Chemical)*	513	599.0							16,108	4,404.16	1.17		31	8.58
	All Stream Types	1,204	2,034.5	298,226	43,506	7,446	92,362	8	441,548		11,861.00	1.69	367		9.85
	All Types	6,516	5,483.7	635,209	648,966	10,629	98,455	57	1,393,316		$29,778.21	.84	214		$4.57
18	Open Reproduction	4,422	2,797.0	497,026	244,705	55	19	177	741,982		$14,529.29	.63	168		$3.28
	Dense Reproduction	59	41.0	746	8,180				8,926		212.97	.69	151		3.61
	All Upland Types	4,481	2,838.0	497,772	252,885	55	19	177	750,908		14,742.26	.63	167		3.29
	Stream (Hand)	584	1,204.7	316,603	9,796	81	57		326,537		6,257.89	2.06	559		10.71
	Stream (Chemical)*	469	532.7							14,163	3,916.68	1.13		30	8.35
	All Stream Types	584	1,737.4	316,603	9,796	81	57		326,537		10,174.57	2.97	559		17.42
	All Types	5,065	4,575.4	814,375	262,681	136	76	177	1,077,445		$24,916.83	.90	213		$4.92
All Units	Open Reproduction	18,149	11,688.5	983,468	2,183,571	7,783	6,548	1,640	3,183,010		$60,717.07	.64	175		$3.34
	Dense Reproduction	271	98.0	3,208	16,963			35	20,206		509.06	.36	74		[illegible]
	Brush	2,002	1,613.5	73,312	383,488	1,987	1,432		460,219		8,381.48	.80	230		4.19
	All Upland Types	20,422	13,400.0	1,059,988	2,584,022	9,770	7,980	1,675	3,663,435		$69,607.61	.66	179		$3.41
	Stream (Hand)	3,385	4,023.2	738,541	213,065	30,592	102,332	993	1,085,523		20,898.86	1.19	321		[illegible]
	Stream (Chemical)*	1,142	1,260.7							32,615	9,269.32	1.10		28	[illegible]
	All Stream Types	3,385	5,283.9	738,541	213,065	30,592	102,332	993	1,085,523		$30,168.18	1.56	321		[illegible]
	All Types	23,807	18,683.9	1,798,529	2,797,087	40,362	110,312	2,668	4,748,958		$99,775.79	.78	199		[illegible]

* Acres in stream type worked by both hand and chemical methods are included only once in totals.

There were 23,807 acres covered by crews which protected an additional 6,019 acres of open reproduction that were systematically covered by camp bosses and checkers and found Ribes free. This gives a total of 29,926 acres protected during this last season at a cost of $3.33 per acre.

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T. G. Guernsey

W. 1087. **Pinus monticola** planted in Allen Creek drainage, St. Joe National Forest in 1916. Ribes eradication performed in 1932.

W. 1088. **Pinus monticola** planted in Cedar Creek drainage, St. Joe National Forest in 1916. Ribes eradication performed in 1932.

METHODS AND EQUIPMENT

Three men working in line was the general crew method used. The 2 and 4-man crews were used during training periods. It is necessary to use a larger sized crew in training men when a limited number of experienced men are available.

The 3-man spray crew was used in chemical work. These men used hand pump spray outfits, spraying 10 per cent sodium chlorate solution (.9 lbs. sodium chlorate per gallon of water).

A check was made of all areas worked. This work was carried on by a separate project which gave detailed information to the eradication project when any area needed reworking.

DISCUSSION OF RESULTS

All areas on which Ribes eradication was planned were completely worked except for part of the Loop Creek area where Ribes were removed from stream type only. It is planned to complete the work on this area to assure protection.

RECOMMENDATIONS

It will be necessary to make a check in 1932 of stream type areas sprayed with chemicals. There were parts sprayed late in the season that may need some respraying.

A periodic inspection or systematic check should be made on all areas worked to determine the extent of survival of Ribes. This is essential in order to plan any reeradication work that may be necessary.

CHECKING AFTER RIBES ERADICATION, ST. JOE NATIONAL FOREST

By

E. L. Joy

Junior Forester

INTRODUCTION

No Ribes eradication had been done on the St. Joe National Forest previous to 1932. Because of this fact no areas on this unit were available for checking until July [illegible]. Between this date and September 14 the area eradicated of Ribes by 17 camps was checked.

Table No. 1 constitutes a record of checking on the various camp areas.

TABLE NO. 1

RIBES PER ACRE AFTER ERADICATION

Camp Number	Type	Per Cent Check	Ribes Per Acre After Eradication: R. petiolare Bushes	R. petiolare Feet Live Stem	R. inerme Bushes	R. inerme Feet Live Stem	R. lacustre Bushes	R. lacustre Feet Live Stem	R. viscosissimum Bushes	R. viscosissimum Feet Live Stem	R. irriguum Bushes	R. irriguum Feet Live Stem	All Species Bushes	All Species Feet Live Stem
1	Open Reproduction	2.0					7	18	4	13			11	31
	Stream	4.0	3	19			8	17					11	36
	All Types	2.3	1	5			7	13	3	9			11	32
2	Open Reproduction	2.0					4	6	2	5			6	11
	Stream *	4.0	7	36	1	3	9	26	1	3			18	68
	All Types	2.9	4	22	1	2	7	18	1	4			13	46
3	Open Reproduction	2.0					4	8	7	26			11	34
	Dense Reproduction	2.0							8	21			8	21
	Stream	3.9	5	15	2	4	7	13					14	32
	All Types	2.2	1	3	N	1	4	8	6	21			11	33
4	Open Reproduction	2.0			N	N	1	4	3	15			4	19
	Stream	5.3	7	11			14	32					21	43
	All Types	2.0	N	N	N	N	1	4	3	15			4	19
5	Open Reproduction	2.3					N	1	1	3			1	4
	Stream	7.8	6	38	2	9	1	9					9	56
	All Types	2.5	1	6	N	1	N	2	1	3			2	12
6	Open Reproduction	2.0					1	5	2	10			3	15
7	Open Reproduction	2.0			N	N	2	10	1	8			3	18
8	Open Reproduction	2.5			N	N	N	N	5	15	N	N	5	15
	Open Pole	2.0											0	0
	Brush	2.0			N	1	N	3	2	2			2	6
	Stream	3.5							1	2			1	2
	All Types	2.4			N	N	N	1	4	10	N	N	4	11
9	Open Reproduction	2.0					1	7	3	22			4	29
	Brush	2.0											0	0
	Stream	2.0											0	0
	All Types	2.0					1	7	3	21			4	28
10	Open Reproduction	2.5					N	N	1	4			1	4
	Brush	4.0											0	0
	Meadow	2.4											0	0
	Stream **	8.0	10	544			3	54					13	598
	All Types	2.6	1	38			N	4	1	3			2	45
11	Open Reproduction	3.0							2	2			2	2
	Brush	2.9			N	2	3	12	8	59			11	73
	Stream	4.0					3	21	N	1			3	22
	All Types	3.1			N	1	3	13	6	42			9	56
12	Open Reproduction	3.1					1	17	3	13			4	30
	Brush	2.5					1	8	4	42			5	50
	Stream	4.0					2	31					2	31
	All Types	2.7					1	12	4	31			5	43
13	Open Reproduction	3.2					N	N	3	12	N	N	3	12
	Stream	3.6	1	5			4	7					5	12
	All Types	3.2	N	N			N	1	3	12	N	N	4	13
All Camps	Open Reproduction	2.2			N	N	1	5	3	12	N	N	4	17
	Dense Reproduction	2.0							8	21			8	21
	Open Pole	2.0											0	0
	Brush	2.4			N	1	1	7	5	32			6	40
	Meadow	2.4											0	0
	Stream	4.3	4	45	1	2	5	16	N	1			10	64
	All Types	2.3	N	4	N	N	2	6	3	13	N	N	5	23

N - Negligible or less than 0.5.
* - Reworked but not rechecked.
** - Apparently poor chemical.
Checkers include variations in types not recognized in Ribes eradication records.

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From Table No. 1 the percentages of acreage in stream type, upland types and all types that supported not over 100, 50 and 25 feet of Ribes live stem per acre were computed. These results are shown in Table No. 2.

TABLE NO. 2

ACRES GROUPED ACCORDING TO AMOUNT OF LIVE STEM AFTER ERADICATION

Type	Per Cent of Acreage With Ribes Live Stem Per Acre Not Exceeding		
	100 Feet	50 Feet	25 Feet
Stream	97.2	75.7	34.[illegible]
Upland	100.0	98.[illegible]	7[illegible].4
All	99.9	95.[illegible]	74.4

From Table No. 2 it is evident that a very large part of both the stream type and upland types had not to exceed 50 feet of live stem per acre. It is also shown that slightly less than 3/4ths of the total acreage was within the 25-foot limit. These results indicate the possibility of raising the protection standard by lowering the allowable amount of live stem per acre after eradication to 25 feet.

COSTS

Checking cost computations for this unit are as follows:

Cost of checking..................$1,222.51
Area reported in eradication report 20,926 acres
Average cost per acre for checking $\frac{1222.51}{20,926}$ = $0.058

RIBES ERADICATION WITH BULLDOZER
COEUR D'ALENE NATIONAL FOREST
By
John F. Breakey
Agent

INTRODUCTION

In addition to the bulldozer operation near Clarkia, Idaho, a late season operation during October and November was carried on near the Honeysuckle Ranger Station on the Coeur d'Alene National Forest. The operation was financed by the U. S. Forest Service and supervised by the Division of Blister Rust Control

PURPOSE

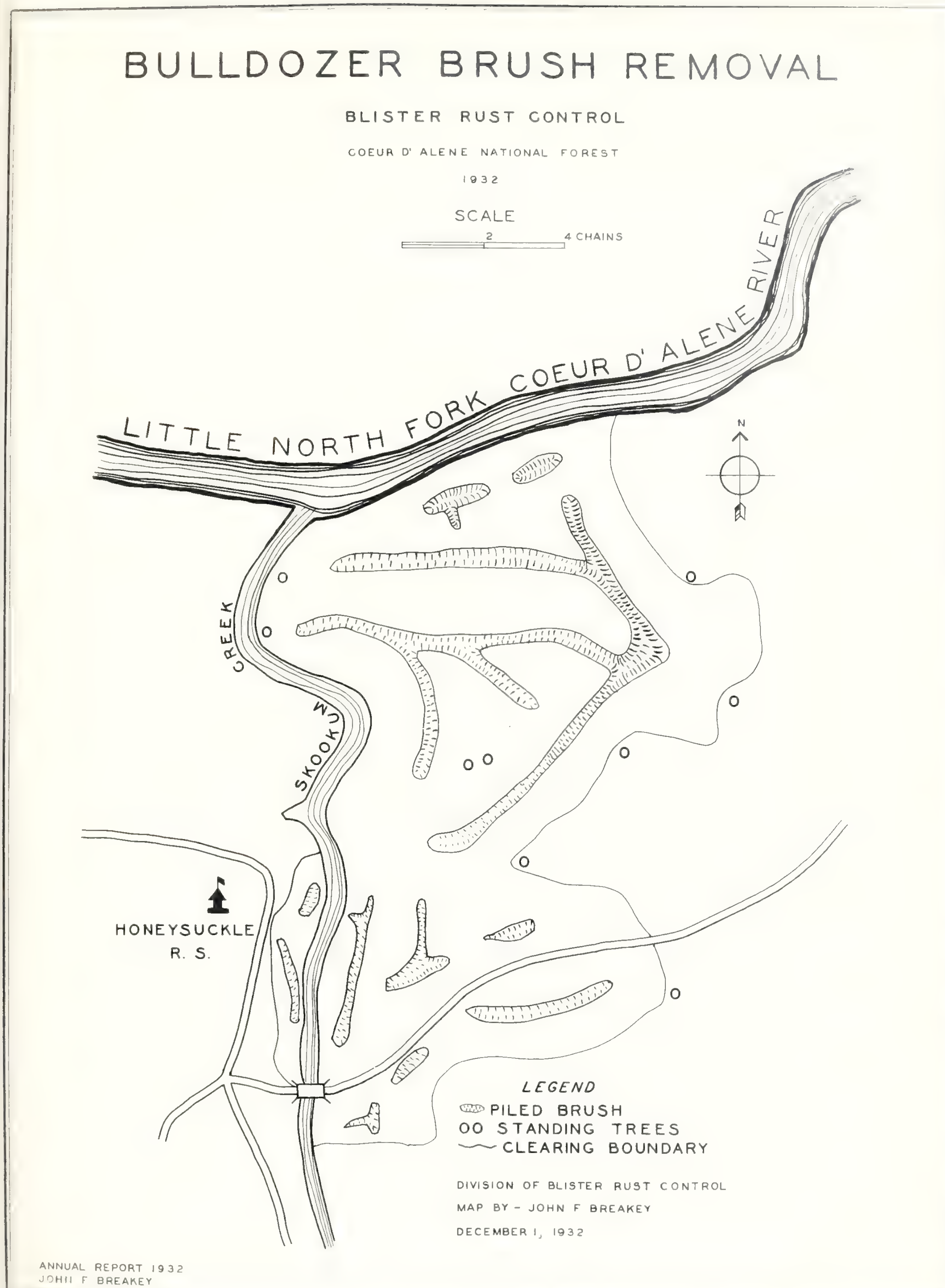
This work represented the beginning of a systematic program for destroying heavy concentrations of Ribes, principally _R. lacustre_, on several areas along the Little North Fork of the Coeur d'Alene River.

The purpose of the 1932 work was to destroy the Ribes and brush on areas near the Honeysuckle Ranger Station by means of tractor equipment. Since this method of Ribes eradication is in its initial stages of development the work was varied somewhat from the way it was conducted at Clarkia for the purpose of finding better methods.

DESCRIPTION OF AREAS

In 1927 and 1930, Ribes eradication work was performed on the Coeur d'Alene National Forest in the vicinity of Honeysuckle Ranger Station. On account of the heavy concentrations of _R. lacustre_ and the heavy brush conditions on certain wide flat bottoms along the Little North Fork of the Coeur d'Alene River, which could not be satisfactorily worked by hand pulling methods, the areas were left for future working. It was on these areas that the bulldozer was used. The particular area which was worked had a large percentage of solid ground which provided firm support for the bulldozer. Beaver dams were numerous. The valley floor contained many stumps which increased the difficulty of working.

All the areas left by the Ribes eradication crews as well as the area worked in the fall of 1932, are located adjacent to fine stands of white pine.


BULLDOZER BRUSH REMOVAL
BLISTER RUST CONTROL
COEUR D' ALENE NATIONAL FOREST
1932
SCALE
2
4 CHAINS
N
LITTLE NORTH FORK COEUR D' ALENE RIVER
CREEK
SKOOKUM
HONEYSUCKLE
R. S.
LEGEND
PILED BRUSH
OO STANDING TREES
CLEARING BOUNDARY
DIVISION OF BLISTER RUST CONTROL
MAP BY - JOHN F BREAKEY
DECEMBER 1, 1932
ANNUAL REPORT 1932
JOHN F BREAKEY

EQUIPMENT AND METHODS USED

A 40-Cletrac tractor equipped with an Isaacson bulldozer and special brush digger was used. The construction of this equipment is fully described in the report "Development of Ribes Eradication Equipment". Its operation is described in the report written by Johnson. In addition to the machine a 60-foot 3/4" wire cable was used in pulling the tractor free from bogs. Also two 20-foot 3/4" wire cables were used for moving large trees and logs.

The method employed necessitated two definite operations:

1. Preparing the area for work by the bulldozer.

2. Removing and piling the brush with the bulldozer.

The first operation called for a preliminary survey of the ground in order to plan the work. A sketch was made to show the limits of the area to be worked, the location of the streams, swamps, beaver dams, standing trees, down logs, and all features of topography which would interfere with the progress of the bulldozer. From this survey it was determined what beaver dams had to come out and what land had to be drained, the snags and trees to be felled and the logs to be moved. The best location for brush piles and windrows was also determined.

On the basis of this plan the preparatory work, involving mostly hand labor, was done.

A crew of five men, provided with axes, saws, wedges, stumping powder, etc, took out the necessary beaver dams, stumps and other obstacles. On the areas where the brush was to be subsequently stacked with the bulldozer, this crew slashed and piled the brush in windrows. This step in the work was to eliminate the mass of green brush under the brush piles which would interfere with burning. Where possible the snags and trees (cottonwood and white fir in most cases) which had to come down were felled on these windrows. Those which could not be dropped directly on a windrow were cut into sections and moved by hand or horses to the preliminary windrows. When necessary the same was done to the down logs already on the area. The purpose of the preliminary windrow construction was to provide air space and fuel under the brush piles to be subsequently made by the bulldozer.

After the necessary work had been done in preparation for the bulldozer, the brush was removed and pushed into the windrows by machine. The operation of the machine on the ground is explained in the report previously mentioned.

[illegible]

A [illegible] special [illegible] fully described in the [illegible] its [illegible] [illegible] [illegible] [illegible].

The [illegible]

1. [illegible]

2. [illegible]

The first [illegible] in order to plan the work. [illegible] area to be worked, [illegible] standing trees [illegible] interfere with the progress of the [illegible] determined [illegible] gained, the dumps [illegible] best location for [illegible].

On the basis of this [illegible] hand labor, was done.

A crew of five men, [illegible] cowmen, etc., [illegible] On the areas where [illegible] bulldozer, [illegible] in the work was to [illegible] which would interfere [illegible] (cottonwood [illegible] on these windrows. [illegible] were cut into sections [illegible] windrows. [illegible] area. [illegible] air space [illegible] bulldozer.

After the [illegible] bulldozer, the [illegible] The operation of [illegible] previously mentioned.

A final clean-up to make the piles more compact was done by lopping any brush which projected from the windrows.

Attention is called to the map of the cleared area showing the location of the windrows of brush. The system of placing the piles away from the streams to get a better fire and of clearing the brush away from standing trees and adjoining slopes to make burning less hazardous were deviations from the method used at Clarkia, Idaho.

RESULTS

As shown on the accompanying map, 10 acres were worked by the bulldozer and prepared for burning. No burning was done in the fall of 1936. An additional 12 acres were prepared for working by the bulldozer.

TABLE NO. 1

STATEMENT OF COSTS

Item	Tractor Area	Slashed Area	Totals
Salaries, permanent	$86.56	$43.28	$129.84
Wages, temporary	149.50	96.80	246.30
Subsistence	51.96	35.24	87.20
Tractor cost - Rental	192.10		192.10
Gas and oil	76.37		76.37
Miscellaneous	1.05		1.05
Totals	$557.54	$175.32	$732.86
Number acres worked	10	12	22
Cost per acre	$ 55.75	$ 14.61	*

* No general acreage cost can be given because only 10 of the 22 acres had both the preparatory and tractor work completed.

CONCLUSION

It is planned to burn the brush piles on this area and to seed it with grass for the complete suppression of R. inerme. This will be done at the most satisfactory time during the 1937 season.

In regard to future operations with the bulldozer, it is anticipated that improvements can be made on the machine itself which will reduce the costs of removing brush. It is also possible that reductions can be made in the costs of preparing the ground for working by the bulldozer. In considering the entire method involved in the suppression of R. inerme including the preparatory work, the bulldozer work, the burning and the seeding, a more complete understanding of all the problems and all the factors influencing costs will make it possible to perform the work on each individual area more satisfactorily and economically.

Obviously this type of work will be expensive regardless of refinements or improvements which may later be made. Hence, in planning work on any stream type area having R. inerme, it is extremely important that the foreman of a tractor unit have the ability to size up areas under consideration and to eliminate any sizeable portions which can be most economically treated by hand pulling methods.

In regard to future operations with the bulldozer, it is anticipated that improvements can be made on the machine itself which will reduce the costs of removing brush. It is also possible that reductions can be made in the costs of preparing the ground for working by the bulldozer. In considering the entire method involved in the suppression of R. lucens including the preparatory work, the bulldozer work, the burning and the seeding, a more complete understanding of all the problems and all the factors influencing costs will make it possible to perform the work on each individual area more satisfactorily and economically.

Obviously this type of work will be expensive regardless of refinements or improvements which may later be made. Hence, in planning work on any stream type area having R. lucens, it is extremely important that the judgment of a trained man have the ability to size up areas under consideration and to eliminate any sizeable portions which can be most economically treated by hand pulling methods.

PREERADICATION SURVEY, COEUR D'ALENE NATIONAL FOREST, 1932

By
C. C. Strong
Associate Forester

PURPOSE

The preeradication survey on the Coeur d'Alene National Forest conducted during the fall of 1932, was made for the following purposes:

1. To determine the location, quality and numerical abundance of white pine on the area surveyed.

2. To determine what portions of this area had the requisite amount of white pine present to constitute white pine type of sufficient value to justify protection from blister rust and to map that white pine accordingly.

3. To determine wherever possible the commonly used age classes represented or, in the event this was not possible, to determine the boundaries of four broad classes; namely, reproduction, pole, mature and over-mature and to map accordingly.

4. To determine the character of stream and upland types as it would affect cost of treating, method and administration of work and the location of control crews in protecting white pine areas against blister rust.

Ordinarily the Division of Blister Rust Control functions only in securing the information called for under 4 above. However, Region One forest officials felt that additional information such as called for under 1, 2 and 3 above should be secured to substantiate that information already available at the Coeur d'Alene Forest and the Regional offices. Regional forest officials suggested that, if the blister rust survey was to be made by experienced and thoroughly competent men, both time and funds could be saved by having the Division of Blister Rust Control undertake the entire program. This was the basis agreed upon.

The Division of Blister Rust Control exercises no authority whatever in the selection of areas for treatment. Those areas designated in this report for protection were selected by a representative of the Regional Forest Office after a thorough analysis of the information secured through the survey and from all other available sources.

Before this report was prepared all field data were compared with available data at the Coeur d'Alene Forest office and both sources of information were utilized in making final determinations.

[illegible]

[illegible]

by

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

[illegible]

[illegible]

[illegible]

The survey party met with whole-hearted cooperation from the Coeur d'Alene Forest officials and were accorded full use of the facilities which could be taken advantage of. This was decidedly helpful to the conduct of the field work.

PERSONNEL

The survey was made by permanent personnel of the Division of Blister Rust Control, all of whom had had extensive experience directing Ribes eradication operations. Through this extensive experience these men had gradually acquired knowledge of the factors affecting cost and methods of treating so that they could recognize in ground conditions the composite of those factors and be enabled to interpolate in terms of man days per acre for treating under any condition existing.

PERIOD OF WORK

The season of the year during which Ribes are in full leaf is the ideal time for a survey of this nature. This period was eliminated, however, because all the men qualified for the work were needed to direct the treating crews. Hence the only choice was to make the survey during the fall immediately following the termination of other control operations which was September 20 to October 25 in this case. The only danger involved in making a survey at that season is due to Ribes being partially and in some locations almost totally defoliated, especially in the latter part of the period. The result is that in the absence of extreme care the tendency is to underestimate control costs which in turn means an underestimation of the men needed to work a given area in a season.

AREA SURVEYED

The main area surveyed is bounded as follows: The forest boundary on the south, east and north; Crooked and Lookout ridges and the line between ranges 1 east and 1 west on the west. Areas excluded were the McPherson burn of 1931 and the heavily alienated portions of townships 49 and 50 north, ranges 1 and 2 east.

In addition to the main area surveyed selected portions of townships 48 and 49 north, ranges 2 and 3 west and the Hayden Creek drainage in township 52 north, ranges 3 and 2 west were covered. Of the latter areas the Cedar and Hayden Creek drainages were covered late in November principally for the purpose of securing information on white pine values. It was too late at that time to make accurate estimates on cost of treating but the information secured on age classes and ground cover will probably permit of close approximations. 519,340 acres were covered by the survey.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

METHODS OF WORKING

The party leader, guided by available information substantiated by information secured on advance inspections, wherever desirable to make them, assigned each night a block for each man for the following day. These men that night mapped their respective blocks to a suitable scale on field sheets. Up-to-date topographic maps served as the basic information for construction of field maps.

In the field it was the duty of each man to so cover his block as to secure accurate information on each of the points enumerated above. Only general rules for covering blocks were prescribed, it being left to the judgment of the individual as to the exact manner in which he could most effectively work. Topography and ground cover were largely the determining factors. Streams, ridges and points of known location such as section lines, peaks, lookouts, roads, trails and planting markers served as guides in determining the recorder's approximate position at all times. This method of determining position is sufficiently accurate for the purposes served by the preeradication survey.

The general instructions with regard to white pine type designations which were followed were:

1. Reproduction:

Generally only those areas having 200 or more white pines per acre were classed as white pine. On sites favorable for white pine areas having from 100-200 thrifty and uniformly distributed white pines per acre with little of other ground cover and other reproduction were classed as white pine if those areas lay below 4,500 feet in elevation and indications were that a good white pine stand would ultimately develop.

2. Pole:

The men making the survey were acting under no very specific instructions with regard to the minimum number of white pine poles per acre which constituted white pine type of sufficient value to warrant protection. Fortunately the bulk of pole stands could be classified at a glance as white pine or non-white pine type. The doubtful cases were handled approximately as follows:

It seemed reasonable, considering the hazards to which pole stands must be subjected between the present and the maturity of the timber, that there should be enough trees present now to promise 10,000 board feet per acre at maturity. It was estimated that the average tree at maturity would scale 500 board feet. Hence 20 trees of pole size per acre would constitute the minimum for this classification. Actually the figure was set at from 20 to 30 depending on the factors affecting the future development of the stand.

[illegible]

The party leader [illegible]

In the field it was the duty of each man [illegible]

The general instructions [illegible]

1. [illegible]

[illegible]

2. [illegible]

[illegible]

[illegible]

3. Mature:

This classification includes all merchantable timber except over-mature, decadent stands. Generally, the doubtful cases were areas intermixed with good white pine and were in most cases not so wide but that the protection zone around the good white pine would include the doubtful areas. For this reason it was not considered sufficiently important to warrant the additional expense which would have been necessary to make an accurate determination.

On isolated areas the determination was left to the judgment of the individual making the survey on that block. The minimum was considered as approximately not less than 20 to 25 per cent by volume of a fairly well stocked stand.

4. Over-mature:

This classification includes very old timber in a decadent condition of which white pine makes up a small percentage of the present stand. It occupies good white pine site and undoubtedly contained a high percentage of white pine earlier which is gradually dropping out due to old age, disease and bark beetle attacks. White pine should reproduce heavily when these decadent stands are removed.

Under average conditions on white pine areas it was possible for one man to cover from one to three sections per day, depending upon the age and density of forest cover and topography. On non-reproducing double burns and areas on which it was doubtful if white pine occupied large enough blocks to warrant protection correspondingly larger acreages were covered per day.

RESULTS OF WORK DONE

Maps accompanying this report show areas classed as white pine and also the acreage which can be worked per man day by quarter sections as determined from the factors affecting working conditions.

The white pine is shown in only three classifications. These classes are: (1) approximately under 60 years of age, (2) approximately 60 years and over, and (3) over-mature. Pole size timber was not included as a class because working conditions in younger pole stands approximate those of reproduction while working conditions in older pole stands approximate those of mature stands.

The map showing working conditions also shows location of R. inermis too heavy to be hand pulled, boundaries of working units, control areas and camp sites, except on areas where camps can be established at almost any desirable point.

Information secured during the progress of previous blister rust control, principally during the period 1927 to 1930, type maps and records of timber cutting operations served as the basis for computing estimates on units 1-9 inclusive. The estimates on those units provide for reworking about 24,000 acres originally worked in 1927 and 1928 and original eradication on all other portions except the Barney Creek drainage where logging was just completed. On the Barney Creek drainage Ribes eradication should be delayed until the Ribes which germinate following logging disturbances are large enough to be readily seen by workers.

The following tabular statements show the information secured from past surveys, principally the 1933 survey, for use in planning blister rust control operations on the portions of the Coeur d'Alene National Forest covered to date:

INFORMATION FOR USE IN FUTURE BLISTER RUST CONTROL OPERATIONS, COEUR D'ALENE NATIONAL FOREST

TABLE NO. 1

AREAS CONSIDERED IN PRESENT PROTECTION PLANS

Working Unit		Size of Unit		N.F. Acreage in Unit		Work Required		
No.	Name	Total Acres	Acres in Prot. Block	Total Acres	Acres in Prot. Block	Man Days	Acres For Bull-dozer	Est. Cost
1	Beauty Creek	8,360	2,790	3,310	2,040	1,039	-	[illegible]
2	Cedar Creek	9,500	3,250	1,570	1,300	960	-	[illegible],760
3	Marie Creek	10,580	10,280	7,210	7,210	1,760	-	10,[illegible]
4	Phantom Creek	[illegible],520	4,110	3,140	3,100	1,030	-	6,160
5	Honeysuckle Creek	8,320	8,320	6,860	6,860	2,380	10	14,180
6	Cascade-Picnic	9,200	9,200	6,960	6,960	2,400	23	10,400
7	Burnt Cabin	8,820	8,820	7,550	7,550	4,100	20	20,600
8	Upper Little River excluding Barney Creek	24,630	23,050	15,140	12,140	9,520	120	63,[illegible]
9	Goose Creek	7,050	3,750	3,050	2,870	1,551	22	10,[illegible]
10	Trail Creek	12,600	12,070	9,460	9,460	4,367	6	29,503
11	Big Elk Creek	7,360	5,300	5,130	4,980	2,324	-	13,948
12	Leiburg Creek	7,560	7,310	4,090	4,090	2,086	-	15,110
13	Laverne Creek	5,250	5,970	4,700	4,700	1,627	16	10,742
14	Cougar Creek	5,300	5,300	4,110	4,110	1,643	-	9,854
15	Upper Tepee	6,550	6,030	5,560	5,360	2,273	9	14,048
16	Middle Tepee	[illegible],620	6,100	4,270	4,220	3,337	165	27,672
17	Lower Tepee	6,630	5,040	1,960	1,910	1,921	150	19,046
18	East Fork	34,750	12,580	6,150	5,180	3,559	73	[illegible]
19	Buckskin Creek	6,320	4,760	3,100	2,710	3,222	44	21,[illegible]
20	Miners Creek	7,480	4,150	2,500	2,500	1,376	-	8,206
21	Flat Creek	12,100	10,690	6,910	6,770	3,781	162	31,786
22	Steamboat Creek	16,350	16,300	14,030	13,920	3,[illegible]	-	[illegible]
23	Yellow Dog-Dorney	12,100	11,300	9,600	9,500	3,948	44	25,880
24	Middle River	9,980	9,220	5,640	5,400	5,314	-	31,304
25	Grizzly	7,860	7,660	3,310	3,770	3,011	-	20,066
26	Graham Creek	6,150	3,310	2,480	1,590	1,317	-	7,902
27	Beaver Creek	23,690	10,390	5,690	4,520	4,655	45	30,330
28	Canyon Creek	7,110	3,120	2,450	1,620	1,121	-	6,736
29	Granite Peak	17,440	6,820	3,630	2,170	3,782	-	22,663
30	East Eagle	24,190	15,170	9,220	8,890	9,246	90	49,970
31	Lost Creek	19,910	15,370	9,490	9,300	9,812	36	56,072
32	Big Creek	45,460	28,730	19,050	15,690	12,476	60	70,466
33	Killarney Creek	15,540	710	1,190	510	329	-	2,694
	All Units	408,830	289,130	202,760	186,410	117,763	1,112	762,[illegible]

TABLE NO. 2

AREAS NOT CONSIDERED IN PRESENT PROTECTION PLANS

Area	Size of Area		White Pine Acreage in Area	
	Total Acres	Acres in Prot. Block	Total Acres	Acres in Protection Block
Independence	[illegible]	-	6,010	-
Rock City	5,920	-	1,660	-
Lower North Fork	33,520	-	7,840	-
East Eagle	8,320	-	2,670	-
Butte Gulch	[illegible]	-	None	-
Bear Gulch	6,300	-	300	-
Murray Block	8,800	-	1,000	-
Dago Peak	6,430	-	130	-
S. E. Block	24,000	-	8,000	-
Lower Little North Fork	6,010	-	2,640	-
Hayden Creek	12,000	-	1,000	-
Barney Creek	2,600	2,600	1,510	1,510
All areas	160,970	2,600	27,240	1,510

*Barney Creek is an exception. It is included in this table because it was not possible to make any estimates such as called for in the last three columns of Table No. 1.

The white pine data on units 3 to 6 inclusive were taken from the latest forest type map and are believed to be very accurate.

All cost estimates were based on a composite effective per man day charge of $6.00 and an average per acre cost for working heavy R. inerme stream type areas of $50.00.

An effective man day is defined as a full day for foremen or laborer actually engaged upon Ribes eradication. All other time such as general supervisors, unit supervisors, camp bosses, checkers, warehousemen, men engaged upon transportation, cooks, flunkies and laborers engaged upon trail and camp construction, etc. is classed as contributing time and is applied as overhead to the composite effective per man day charge.

It is noted that in the case of Unit No. 13, Laverne Creek, the area in the protection block totals more than the actual area of the unit. This is accounted for by the fact that the white pine extends to, and slightly across, the ridge between the unit and the area to the south which is not included in the protection plans. However, it is proposed to give full protection to the top of the ridge only which necessitates working a one-fourth mile strip outside the unit boundary. This same

condition applies to some of the other units but in no other case does it cause the area of the protection block to exceed the actual area of the working unit.

GENERAL INFORMATION

The area included in the McPherson burn of 193[illegible] was found to have been so severely burned as not to permit of any forecasts as to what might be expected in the way of future forest growth. Nor was it possible to estimate what would be the future Ribes growth. Hence the only work done on this area was that which constitutes the basis for these general statements.

The 1926 burn in the vicinity of Magee Ranger Station was completely covered although on a more extensive basis than was the survey made on the portions of the forest not burned over recently. For the most part the portion of the 1926 burn which represents a single burn only is reproducing heavily to the species which undoubtedly constituted the original stand. However, it appeared to be too early to say definitely what portions would have a satisfactory stand of white pine in the future. The fire hazard is so great on the single burn as to constitute a menace to any contemplated control efforts in the near future. Furthermore, Ribes growth is very heavy and working conditions severe. For the reasons given it is felt that attempts to treat this general area for the control of blister rust would be neither practical nor economically justifiable at the present time.

THE BLISTER RUST SITUATION ON THE COEUR D'ALENE NATIONAL FOREST

During the late summer of 193[illegible] extensive scouting was conducted over the bulk of the forest. White pine infection as follows was found:

TABLE NO. [illegible]

WHITE PINE INFECTIONS FOUND ON THE COEUR D'ALENE NATIONAL FOREST

T.	R.	Sections	No. Trees Exam.	No. Trees Infected	Number Cankers (Actual or Approximately)
49N	[illegible]	21-23,35-36	600	1	1
50N	[illegible]	24	400	2	10
50N	3E	14	300	25	100
52N	[illegible]	33	250	10	20
52N	3E	29	300	1	1
52N	2E	30	475	1	1
51N	1E	7,8,9,16	-	[illegible],000 (est.)	10,000 (est.)

The center of the latter infection is at the mouth of Burnt Cabin Creek on the Little North Fork of the Coeur d'Alene River.

The results of the scouting, due to the nature of the rust, do not tell the whole story. They merely lend emphasis to the belief that the whole forest is potentially infected. However, it is believed that the Honeysuckle Ranger District is the most vulnerable area at the present time so far as the rust is concerned.

RECOMMENDATIONS

It is not within the scope of this report to make any specific recommendations as to the course of action to be followed other than to encourage first treatment in what appears to be the most immediately threatened portion of the forest, the Honeysuckle Ranger District and contiguous areas. To do this would mean, in addition, taking full advantage of the work done in 1927 and 1928 when approximately 24,000 acres were treated.

[illegible]

[illegible]

COOPERATIVE LOCAL CONTROL
CLEARWATER TIMBER PROTECTIVE ASSOCIATION

By
B. A. Anderson, Junior Forester - in Charge
L. L. White, Agent - Assistant

INTRODUCTION

When blister rust control working plans for the Clearwater Timber Protective Association were formulated, it was recognized that stream type Ribes represent the greatest danger in the spread of the disease. Therefore, it was decided to eradicate these Ribes within the next four or five years from the greatest possible area that available funds permitted. This was to be followed by a second eradication or "mopping up" two or three years after the initial work. It was believed that the removal of the stream type Ribes would retard the spread of the rust sufficiently to permit removal of the upland Ribes before material damage to the pine resulted, which now appears to be the case. However due to the rapid spread and intensification of the rust as evidenced by the great amount of rust showing up in the last year, it was deemed dangerous to delay longer the removal of the upland Ribes. Therefore 1932 working plans called for:

1. The removal of upland Ribes from areas where the stream type had been worked two or three years before.

2. Reworking of stream type on area where upland areas are worked.

3. The initial eradication of Ribes from stream type on unworked portions of working unit No. 10.

During 1932 a total of $30,000, a decrease of $30,000 from 1931, was available for local control of white pine blister rust on the Clearwater Timber Protective Association. The following is a statement of the net allotment for project E.42-1 after the 8-1/3 per cent reduction in Federal funds had been accounted for:

Federal funds..............	$18,864.28
Cooperative funds.......	10,094.68
Net allotment..............	$28,958.96

LOCATION AND DESCRIPTION OF AREA

The eradication of the upland Ribes was started in working unit No. 1 on the Casey, Parallel, Alder, Loop and North Fork of Reed's Creek

A. 87. Looking south 70° E. across Schofield burn on the Clearwater Timber Protective Association. Practically the entire area, about ten sections, now supports an excellent stand of white pine reproduction. Heavy concentrations of R. petiolare on the streams and R. viscosissimum on the uplands will undoubtedly raise average protection costs. The Schofield burn is the largest burned over area on the Association. Clearwater National Forest in background. Picture by 116th Photo Section.

Annual Report 1932
B. A. Anderson

drainages. No work was done on the latter drainage above Headquarters because logging operations had been too recent. All stream type originally worked in 1929 on these drainages was reworked.

Initial stream type Ribes eradication work was done in working unit No. 10. This work rounded out, in so far as possible, the entire area on which stream type Ribes eradication had been started.

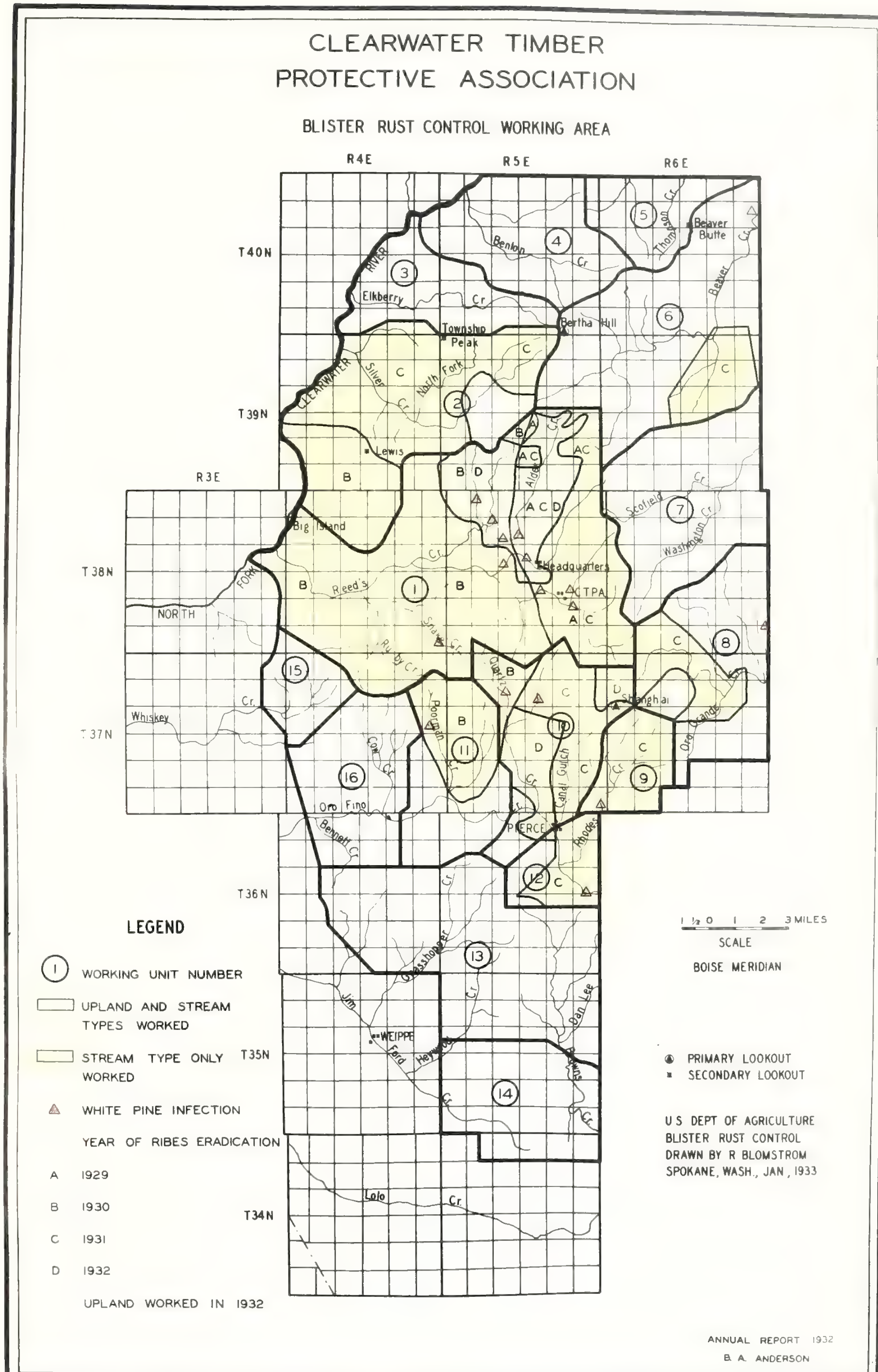
The map, included in this report, shows the areas where work has been done. No attempt was made to locate Ribes infections because a close inspection of Ribes on any drainage in 1932 revealed the presence of the rust.

METHODS AND EQUIPMENT

Approximately 100 men, divided into 4 25-man camps, were employed from the middle of June to September 6th. It was possible to locate most of the camps on roads where they could be supplied directly by truck. Necessary pack stock was secured from the Clearwater Timber Protective Association.

Heretofore no upland Ribes eradication work had been done on the Association. As a consequence it was necessary to train every man on the job in this type of eradication. It required the constant attention of supervisors during the early part of the season to accomplish this.

Heavy concentrations of R. viscosissimum were found in sections 22, 23 and 24 in the upper end of the Alder Creek drainage. The Ribes growing to immense bushes and mixed with dense brush, were extremely difficult to eradicate. The crews carried small trench picks or used a specially devised mattock with a claw arrangement to aid in grubbing out the Ribes.


CLEARWATER TIMBER
PROTECTIVE ASSOCIATION
BLISTER RUST CONTROL WORKING AREA
R4E
R5E
R6E
R3E
T40N
T39N
T38N
T37N
T36N
T35N
T34N
CLEARWATER
RIVER
NORTH
FORK
Elkberry
Cr
Benton
Cr
Thompson Cr
Beaver Butte
Beaver Cr
Bertha Hill
Township Peak
Silver Cr
North Fork
Lewis
Big Island
Alder
Scofield
Washington
Cr
Headquarters
CTPA
Reed's
Snake Cr
Ruby Cr
Whiskey
Cr
Quartz
Poorman
Shanghai
Oro Grande
Canal Gulch
Cow Cr
Oro Fino
Bennett Cr
PIERCE
Rhodes
Grasshopper
Cr
Jim Ford
WEIPPE
Hayes Cr
Dan Lee
Lolo
Cr
Cr
LEGEND
WORKING UNIT NUMBER
UPLAND AND STREAM TYPES WORKED
STREAM TYPE ONLY WORKED
WHITE PINE INFECTION
YEAR OF RIBES ERADICATION
A 1929
B 1930
C 1931
D 1932
UPLAND WORKED IN 1932
1 ½ 0 1 2 3 MILES
SCALE
BOISE MERIDIAN
PRIMARY LOOKOUT
SECONDARY LOOKOUT
U S DEPT OF AGRICULTURE
BLISTER RUST CONTROL
DRAWN BY R BLOMSTROM
SPOKANE, WASH., JAN., 1933
ANNUAL REPORT 1932
B. A. ANDERSON

ANALYSIS OF COSTS

TABLE NO. 1

STATEMENT AND ANALYSIS OF COSTS OF OPERATION

Item of Expenditure		Cost: Per Item	Cost: Total
Salaries and Wages	Permanent men	$3,655.46	
	Temporary field men	15,608.38	$19,263.84
Subsistence	Wages, cooks and flunkies	1,132.99	
	Cost of food	4,568.10	
	Transportation of food	612.99	6,314.08
General Equipment	Cost	94.13	
	Repairs	407.32	
	Transportation	451.41	952.86
Chemical Equipment	Cost	2.50	
	Repairs	179.36	
	Transportation	30.00	211.86
Miscellaneous	Supplies	55.27	
	Expenses	370.39	
	Twine	416.23	
	Operation of cars by supervisors	182.29	1,044.10
Chemical Charge	Cost	1,040.42	
	Transportation	366.30	1,406.72
Grand total			$29,203.54

Statement of Expenditures According to Fiscal Years:

Fiscal Year 1932, period 4/1/32-6/30/32..........$9,806.35
Fiscal Year 1933, period 7/1/32-3/31/33..........19,397.19
Grand total............$29,203.54

Statement of Meal Costs:

Total cost of subsistence........................$6,314.08
Number of meals served.............23,224
Average cost per meal served...$.27

Cost of Checking Work:

Salaries and expenses of temporary men............$ 663.37
Subsistence of temporary men (250 meals @ 27¢ ea.) 67.50
Total cost................$ 720.87

Cost per acre checked $720.87/13,200.......$.055

Statement of Composite Cost per Effective Man Day:

Total cost of operation.............................. $29,203.54
Less chemical charges:
    Equipment and repairs...........$211.86
    Chemicals...................1,406.72......... 1,618.58
Cost less chemical charges........................... $27,584.96

Number of effective men days.......4,664
Cost per effective man day $27,584.96/4,664......$5.91

Cost of chemical equipment and
repairs............................$211.86
Number of effective spraying man
days.............................. 569
Additional cost per spraying man
day $211.86/569...............................$ .37
Cost per effective man day while spraying $5.91 plus $.37.... $6.28

Statement of Chemical Costs:

Cost of chemical.................................... $1,406.72
Number of gallons applied..............12,280
Cost per gallon........................$.1146

WORK PERFORMED AND RESULTS

The following tables give a summary of the work accomplished:

TABLE NO. 2

INITIAL RIBES ERADICATION ON CLEARWATER TIMBER PROTECTIVE ASSOCIATION, 1932

Working Unit No.	Type	Acres	Man Days	Number of Ribes Pulled: R. lac.	R. vis.	R. pet.	R. iner.	Total Ribes	No. Gals. Spray	Total Cost	Per Acre Basis: Man Days	Ribes	Gals. Spray	Cost
1	O. R.	999	460	41,949	101,616	266	153	143,984		$2,720.62	.46	144		$ 2.72
	D. R.	888	215	18,621	20,252	157		39,030		1,271.89	.24	44		1.43
	O. F.	507	402	130,411	210,081	3,355	6	343,853		2,377.59	.79	678		4.69
	D. F.	204	44	710	9,529			10,239		260.23	.22	50		1.28
	O. M.	7,712	1,570	303,363	51,376	4,979	11,760	371,478		9,285.61	.20	48		1.20
	D. M.	494	42	4,212	199	244		4,655		248.40	.09	9		.50
	Brush	419	478	35,614	108,663	424	114	144,815		2,827.08	1.14	346		6.75
	All Upland	11,223	3,211	534,880	501,716	9,425	12,033	1,058,054		$18,991.12	.29	94		$ 1.69
10	Str. (hand)	448	289	34,348	30,798	468	7,073	72,687		1,709.26	.65	162		3.82
	Str. (chem.)*	268	306						8,376	2,883.49	1.14		31	10.76
	All Str.	448	595	34,348	30,798	468	7,073	72,687	8,376	$4,592.75	1.33	162		$10.25
All Types		11,671	3,806	569,228	532,514	9,893	19,106	1,130,741	8,376	$23,583.87	.33	97		$ 2.02

*When some acres in stream type are worked by both hand and chemical methods, these acres are included in totals only once.

TABLE NO. 3

SECOND RIBES ERADICATION WORK ON CLEARWATER TIMBER PROTECTIVE ASSOCIATION, 1932

Working Unit No.	Type	Acres	Man Days	Number of Ribes Pulled: R. lac.	R. vis.	R. pet.	R. inerme	Total Ribes	No. Gals. Spray	Total Cost	Per Acre Basis: Man Days	Ribes	Gals. Spray	Cost
1	Str. (hand)	1,529	595	170,833	8,435	17,784	6,784	203,836		$3,519.07	.39	133		$ 2.30
	Str. (chem.)*	524	263						3,904	2,100.60	.50		7	4.01
	All Stream	1,529	858	170,833	8,435	17,784	6,784	203,836	3,904	$5,619.67	.56	133		$ 3.68

* When some acres in stream type are worked by both hand and chemical methods, these acres are included in totals only once.

W. 1108. White pine reproduction on Alder Creek railroad fill. Clearwater Timber Protective Association.

W. 1136. White pine cut on a sustained yield basis. Residual stand 70 per cent white pine. Dense type. Very little ground cover. In this area the residual stand is so dense that very few Ribes have developed. Clearwater Timber Protective Association.

A total of 11,223 acres of upland type was completely worked at a cost of $1.69 per acre. On this same area 1,529 acres of stream type, first worked in 1929, were reworked. The working of the 11,223 acres of upland and reworking of the 1,529 acres of stream type afforded complete protection to 12,752 acres of white pine. A total of 448 acres of initial work on stream type was completed to afford partial protection to 1,800 acres of white pine.

DISCUSSION AND ANALYSIS

In accordance with the labor policy outlined last winter fully 50 per cent of the men employed could be classified as local labor. This type of labor performed very well and it is deemed advisable to continue the policy of giving local men preference. However, there are certain qualifications necessary to make a good Ribes eradication worker which should not be lost sight of. We must train men who will be available for supervision in the future.

The weather conditions of the past summer were evidently favorable to the spread of the rust. There was scarcely a drainage in the Clearwater region which, if examined closely, did not reveal blister rust infection on Ribes. This is a fact of very great importance in planning future control operations. There is every reason to believe that a very great deal of pine infection took place this year within the boundaries of the Association. Several years later the results of this 1933 wave of infection will appear in the form of very numerous new infection centers, which will from that time on rapidly develop in size and intensity.

In view of these infection conditions, it must be recognized that if the control program now under way is to be successful, it must be completed within the next few years. The situation obviously calls for a sharp and determined effort in the near future. If the white pine is to be protected from severe blister rust damage the Ribes within that area must be removed before the new cankers, formed in 1933, have developed sufficiently to cause another wave of infection.

Therefore the Division of Blister Rust Control recommends;

1. The immediate completion of stream type Ribes eradication.

2. The eradication of all upland Ribes in the white pine areas within the next few years.

3. The reworking, as rapidly as is necessary, of all areas to be protected.

A total of 11,22? acres of upland type was completely [illegible] at a cost of $1.69 per acre. On this same area 1,539 acres of stream type, first worked in 1929, were reworked. The working of the 11,22? acres of upland and reworking of the 1,539 acres of stream type afforded complete protection to 12,7?? acres of white pine. [illegible] work on stream type was completed to afford partial protection to ?,??? acres of white pine.

DISCUSSION AND ANALYSIS

In accordance with the labor policy [illegible] [illegible] of the men employed [illegible] [illegible] type of labor [illegible] very well [illegible] the policy of giving local men preference. [illegible] qualifications necessary [illegible] should not be lost sight of [illegible] supervision in the future.

The weather conditions of the past summer were evidently favorable to the spread of the rust. There was scarcely a crossing in the [illegible] region which, if examined closely, did not reveal blister [illegible] Ribes. This is a fact of very great importance in planning future control operations. There is every reason to believe that a very great deal of pine infection took place this year within the boundaries of the Association. Several years later the results of this 1932 wave of infection will appear in the form of very numerous new infection centers, which will from that time on rapidly develop in size and intensity.

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2. The eradication of all upland Ribes in the white pine areas within the next few years.

3. The reworking, as rapidly as is necessary, of all areas to be protected.

CHECKING AFTER RIBES ERADICATION

CLEARWATER TIMBER PROTECTIVE ASSOCIATION

By

E. L. Joy.

Junior Forester

INTRODUCTION

On the Clearwater Timber Protective Association a total of 13,200 acres was checked. (11,571 acres of this was original work in 1932; 1,629 acres was stream type reworked in [illegible]). Table No. 1 shows by camp, the Ribes per acre in each type after eradication.

TABLE NO. 1

RIBES PER ACRE AFTER ERADICATION

Camp	Type	Per Cent Check	Ribes Per Acre After Eradication									
			R. petiolare		R. inerme		R. lacustre		R. viscosissimum		All Species	
			Bushes	Feet Live Stem	Bushes	Feet Live Stem	Bushes	Feet Live Stem	Bushes	Feet Live Stem	Bushes	Feet Live Stem
W	Open Reproduction	2.0									0	0
	Dense Reproduction	2.0			N	N	3	10	1	13	4	23
	Open Pole	2.0							16	8	16	8
	Dense Pole	2.0							N	1	N	1
	Open Mature	2.0					4	25	N	2	4	27
	Dense Mature	2.0					N	3	N	N	N	4
	Cutover-Open Pole	2.0							1	4	1	4
	Cutover-Open Mature	2.0					10	12	17	15	27	27
	Cutover-Clear	2.0	6	4			36	78			42	92
	Brush	2.0									0	0
	Meadow	2.0									0	0
	Stream	3.6	6	29	N	1	12	31			15	61
	All Types	2.1	1	2	N	N	5	19	1	4	7	25
X	Open Reproduction	2.0	2	3			25	34	14	55	41	92
	Dense Reproduction	2.0					3	15	3	16	6	31
	Open Pole	2.0					1	2	3	8	4	10
	Dense Pole	2.0					N	N	1	5	1	5
	Open Mature	2.0					8	57	N	3	8	60
	Dense Mature	2.0									0	0
	Cutover-Open Mature	2.0	1	1			21	79	2	3	24	83
	Brush	2.0									0	0
	Meadow	2.0									0	0
	Stream	2.7	12	108	1	4	12	85			25	197
	All Types	2.0	1	9	N	N	7	43	1	5	9	57
Y	Open Reproduction	2.0					3	23	13	111	16	134
	Dense Reproduction	2.0					2	13	3	16	5	29
	Open Pole	2.0									0	0
	Dense Pole	2.0									0	0
	Open Mature	2.0					4	17	12	81	16	98
	Dense Mature	2.0									0	0
	Cutover-Open Mature	2.0	N	1			16	63	3	4	19	68
	Cutover-Clear	2.0					2	2	96	58	98	60
	Cutover-Burn	2.0					41	134	70	87	111	221
	Brush	2.0							23	138	23	138
	Stream	3.0	4	20	1	3	21	72	2	2	28	97
	All Types	2.0	N	1	N	N	7	28	13	55	20	84
Z	Open Reproduction	2.0							6	44	6	44
	Dense Reproduction	2.0					8	49	3	23	11	72
	Open Pole	2.0									0	0
	Dense Pole	2.0									0	0
	Open Mature	2.0					3	20	N	2	3	22
	Dense Mature	2.0									0	0
	Stream	4.0	4	16	N	3	5	39	4	7	13	65
	All Types	2.6	2	7	N	2	4	29	2	5	8	43
Fly Camp (Dull Axe)	Open Pole	2.0							7	16	7	16
	Brush	2.0					5	61	11	139	16	200
	Stream	2.0	25	525							25	525
	All Types	2.0	1	20			4	38	9	92	14	150
All Camps	Open Reproduction	2.0	N	N			5	20	11	86	16	106
	Dense Reproduction	2.0			N	N	3	14	2	15	5	29
	Open Pole	2.0					N	1	5	9	5	10
	Dense Pole	2.0					N	N	1	4	1	4
	Open Mature	2.0					5	32	1	5	6	37
	Dense Mature	2.0					N	3	N	N	N	3
	Cutover-Open Pole	2.0							1	4	1	4
	Cutover-Open Mature	2.0	N	N			14	36	11	11	25	47
	Cutover-Clear	2.0	4	3			28	59	24	15	56	77
	Cutover-Burn	2.0					41	134	70	87	111	221
	Brush	2.0					2	17	18	130	20	147
	Meadow	2.0									0	0
	Stream	3.7	5	30	N	3	8	44	3	5	16	82
	All Types	2.2	1	5	N	1	5	28	3	9	9	43

N - Negligible or less than 0.5.
Checkers included variations in types not recognized in Ribes eradication records.

Annual Report 1932
E. L. Joy

From Table No. 1 the percentages of acreage in stream type, upland types and all types that supported not over 100, 50, and 25 feet of Ribes live stem per acre were computed. These results are shown in Table No. 2.

TABLE NO. 2

ACRES GROUPED ACCORDING TO AMOUNT OF LIVE STEM AFTER ERADICATION

Type	Per Cent of Acreage With Ribes Live Stem Per Acre Not Exceeding		
	100 Feet	50 Feet	25 Feet
Upland	96.2	74.8	37.6
Stream	84.1	0.0	0.0
All	95.0	67.5	34.0

It is seen in Table No. 2 that although only 5 per cent of the total acreage supports over 100 feet of Ribes live stem per acre, 32.5 per cent is over the 50 foot limit. Thus, the acreage with more than 50 but less than 100 feet of live stem per acre is 27.5 per cent of the total.

COSTS

The checking cost computations for the Clearwater Timber Protective Association are as follows:

Cost of checking.......................... $720.87
Acres initial and second Ribes eradication reported.............................. 13,200
Average cost per acre for checking....... $\frac{720.87}{13,200}$ = $.055

COOPERATIVE RIBES CONTROL IN THE UPPER ST. MARIES RIVER DRAINAGE

By

B. A. Anderson

Junior Forester

INTRODUCTION

Ribes eradication work started in the Upper St. Maries River drainage in 1931 was continued during the 1932 season. The Division of Blister Rust Control cooperated with the Potlatch Forests, Incorporated, the Milwaukee Land Company and the State of Idaho on a "one-for-one" basis, the basis upon which cooperative Ribes eradication has been conducted in the past.

The following is a statement of the net allotment for this work after the 8-1/3 per cent reduction in Federal funds had been accounted for.

Federal funds...........	$2,173.32
Cooperative funds......	1,200.00
Net allotment..........	$3,373.32

LOCATION AND DESCRIPTION OF AREA

Ribes eradication was performed in sections 23, 25, 26, 27, 34, 35 and 36 of township 43 north, range 2 east on the South Fork of the Middle Fork of the St. Maries River. The entire area is classed as excellent white pine site and supports a fine stand of white pine of various age classes. During the latter part of 1931 a severe fire swept to the ridge top in sections 27 and 34 bounding the area worked on the west. This fire spotted over into the Middle Fork drainage in these two sections and burned over about 154 acres.

Ribes *petiolare* occurred in heavy concentrations on the main stream. Very little *R. inerme* is found on this part of the working unit. *R. lacustre* and *R. viscosissimum* occur generally over all of the upland types.

METHODS, EQUIPMENT AND MATERIALS

Twelve men were employed on the project. These men were divided into 3-man crews when hand pulling, and 3 to 5-man crews when spraying.

A 10 per cent solution of sodium chlorate was used in all spray work. No spraying was done after August 15.

Camp equipment, supplies and chemical were packed in by the Forest Service at Clarkia according to an agreement made at the start of the field season.

COOPERATIVE LOCAL CONTROL ON THE UPPER ST. MARIES RIVER [illegible]

by

S. A. Anderson

Junior Forester

[illegible]

Ribes eradication work started in the Upper St. Maries River drainage in 1931 was continued during the 1932 season. The Division of Blister Rust Control cooperated with the Potlatch Forests, Incorporated, the Milwaukee Land Company and the State of Idaho on a "two-for-one" basis, the basis upon which cooperative Ribes eradication has been conducted in the past.

The following is a statement of the net allotment for this [illegible] after the 8-1/3 per cent reduction in Federal funds had been accounted for.

Federal funds..........$2,172.52
Cooperative funds..... 1,200.00
[illegible]

[illegible]

Ribes eradication was performed in sections 23, 25, 26, 27, 34, 35 and 36 of township 42 north, range 2 east on the South Fork of the Middle Fork of the St. Maries River. [illegible] excellent white pine site and supports a fine stand of white pine of various age classes. During the latter part of 1931 [illegible] top in sections 27 and 34 bounding the [illegible] burned over about 154 acres.

Ribes petiolare occurred in heavy concentrations on the main stream. Very little *R. inerme* is found on this part of the working unit. *R. lacustre* and *R. viscosissimum* occur generally over all of the upland types.

[illegible]

Twelve men were employed on the project. These men were divided into 3-man crews when hand pulling, or 2 to 5-man crews when spraying.

A 10 per cent solution of sodium chlorate was used in all spray work. No spraying was done after August 15.

Camp equipment, supplies and chemical were packed in by the Forest Service at Clarkia according to an agreement made at the start of the field season.

UPPER ST. MARIES RIVER DRAINAGE

CLARKIA PROJECT

BLISTER RUST CONTROL WORKING AREA

1 ½ 0 1 2 3 MILES

SCALE

BOISE MERIDIAN

Legend

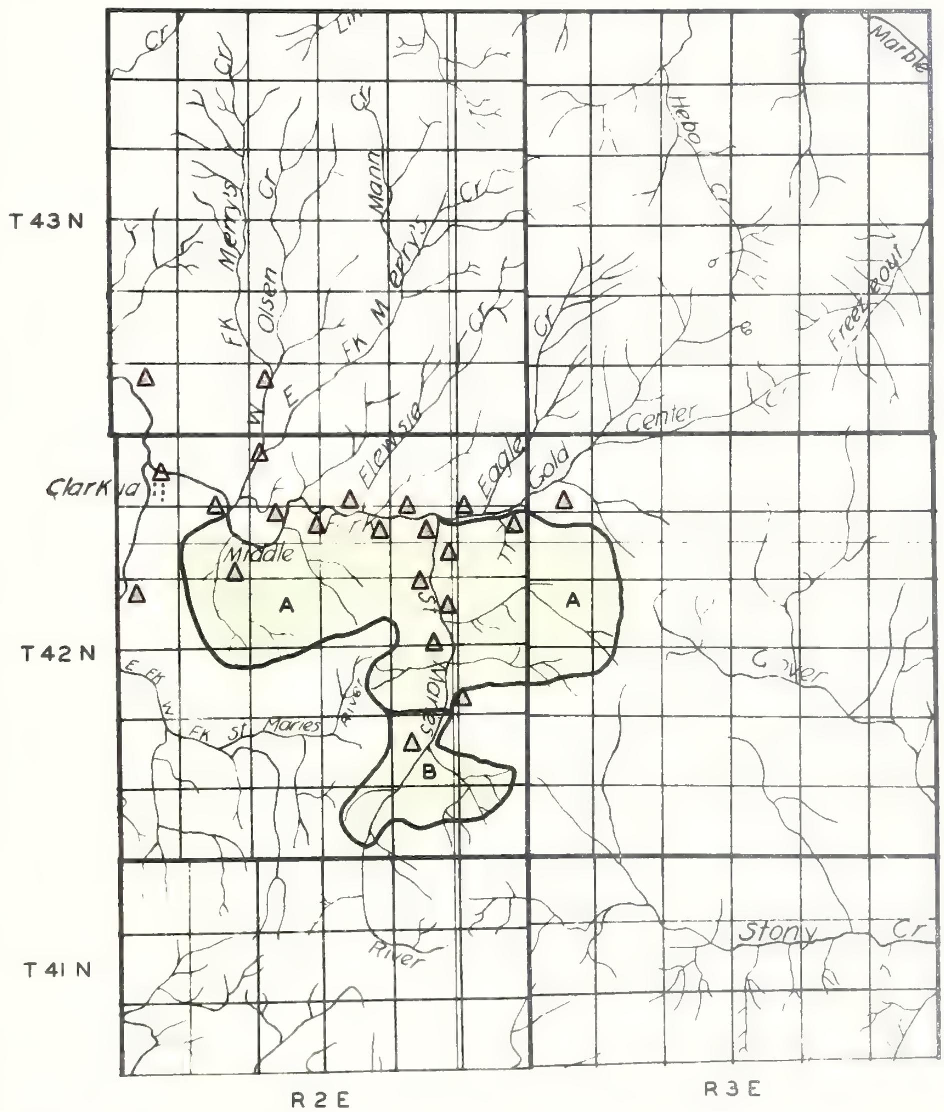
△ WHITE PINE INFECTION

▭ UPLAND AND STREAM TYPES WORKED

A 1931 ERADICATION

B 1932 ERADICATION

U. S. DEPARTMENT OF AGRICULTURE
BLISTER RUST CONTROL
DRAWN BY R. BLOMSTROM
SPOKANE, WASH., JAN., 1933



ANNUAL REPORT 1932
B. A. ANDERSON

ANALYSIS OF COSTS

TABLE NO. 1

STATEMENT OF COST OF OPERATION

Item of Expenditure		Cost: Per Item	Cost: Total
Salaries and Wages	Permanent men	$470.37	
	Temporary field men	2,014.21	$2,484.58
Subsistence	Wages, cooks and flunkies	221.67	
	Cost of food	511.98	
	Transportation of food	85.42	819.07
General Equipment	Cost	-	
	Repairs	116.84	
	Transportation	77.94	194.78
Chemical Equipment	Cost	-	
	Repairs	56.01	
	Transportation	5.00	61.01
Miscellaneous	Supplies	8.25	
	Expenses	28.02	
	Twine	86.05	
	Operation of cars by supervisors	13.04	135.36
Chemical Charge	Cost	228.85	
	Transportation	89.74	318.59
Grand Total			$4,013.39

Classification of expenditures according to fiscal years:

Period April 1-June 30, 1932..............$1,742.08
Period July 1-March 31, 1933.............. 2,271.31
Total........................$4,013.39

Cost of checking work:

Subsistence of checker -
133 meals @ 28¢ per meal..................$37.24
Total Cost (included in Table No. 1)....... 37.24

Cost per acre checked $37.24/1570 = $0.024
No salary charge against 3.42-3.

Statement of meal costs:

Total cost of subsistence..................$819.07
Number meals served.............2,933
Average cost per meal served....$.28

STATEMENT OF COMPOSITE COST PER EFFECTIVE MAN DAY

Total cost of operation .... $4,01[illegible]

Less chemical charges:
    Equipment and repairs......................... $61.01
    Chemicals..................................... $318.59 .... $[illegible]

Cost less chemical charges.. $3,6[illegible]

Number of effective man days............... 574
Cost per effective man day......$3,6[illegible]/574.......................... $6.33

Cost of chemical equipment and repairs........ $61.01
Number of effective spraying man days......... 131
Additional cost per spraying man day.......... $61.01/131.......... $ .47
Cost per spraying man day = $6.33 + $.47.......................... $6.80

Statement of Chemical Costs

    Cost of chemical.. $318.5[illegible]
    Number of gallons applied..................................... 3,8[illegible]
    Cost per gallon... $.08[illegible]

WORK PERFORMED AND RESULTS

The following table gives a summary of the work accomplished:

TABLE NO. 2

SUMMARY OF INITIAL RIBES ERADICATION ON UPPER ST. MARIES RIVER

1932

Working Unit No.	Type	Acres	Man Days	Number of Ribes Pulled: R. lacustre	R. visco.	R. petiolare	R. inerme	Total Ribes	Number Gallons Spray	Total Cost	Per Acre Basis: Man Days	Ribes	Gallons Spray	Cost
1	O.R.	44	16	3,896	1,713	76	-	5,685	-	$101.28	.36	129	-	$2.30
	D.C.	334	192	7,539	7,357	50	-	14,946	-	772.26	.57	64	-	3.30
	O.F.	66	4	386	15	-	-	401	-	25.32	.06	6	-	.38
	O.[illegible]	619	112	11,682	320	6	10	12,018	-	709.37	.18	19	-	1.15
	D.[illegible]	63	6	658	-	-	-	658	-	37.38	.10	10	-	.60
	Brush	154	-	-	-	-	-	-	-	-	-	-	-	-
	All Upland	1,180	260	24,161	9,405	132	10	33,708	-	$1,645.61	.22	29	-	$1.39
	Str. (hand)	390	183	32,812	540	1,148	15	34,515	-	1,155.39	.47	89	-	2.97
	Str. (chem.)*	31	131	-	-	-	-	-	3,839	1,200.19	1.63	-	47	14.93
	All Stream	390	314	32,812	540	1,148	15	34,515	-	$2,367.58	.81	89	-	$6.07
	All Types	1,570	574	56,973	9,945	1,280	25	68,223	-	$4,013.39	.37	43	-	$2.56

*When same acres in stream type are worked by both hand and chemical methods, these acres are included only once in totals.

DISCUSSION AND ANALYSIS

In accordance with the practice on all projects this season all acreage worked was checked for missed bushes and poor spray work. The final check of the entire area showed an average of 15.7 feet of Ribes live stem missed per acre. On no timber type did the missed live stem exceed 45 feet per acre.

Special attention was paid to the spray work. Every effort was made to secure 100 per cent coverage on both upper and lower surfaces of the foliage of Ribes bushes. In addition a ground drench was applied about the base of each bush, thereby insuring a thorough crown application. Where R. petiolare was growing in beaver dams the dams were pulled out and the water allowed to lower as much as possible before the bushes were sprayed.

The areas burned over by the 1931 fire in sections 27 and 34 will undoubtedly support a heavy growth of R. viscosissimum within two or three years. Observations of what has happened to similar areas burned over in this region in past years is the basis for this statement.

Infection was found on stream type Ribes near the center of section 36, township 42 north, range 2 east. About a mile down stream from this point scattered infections on white pine are beginning to show and from here to the forks, the pine is badly flagged. Severe pine damage resulting from infection taking place previous to Ribes eradication may be expected within the next few years in the fringe along stream type.

White pine blister rust has a secure foothold in the Clarkia region. Unless a definite control program is put into effect immediately and administered on a permanent basis, the excellent stands of young white pine in this region will be wiped out. The control work done up to this time will be entirely vitiated unless future control work is carried out on a systematic basis. The 1932 operation was entirely too small to cope with the situation.

CHECKING AFTER RIBES ERADICATION

UPPER ST. MARIES RIVER AREA

By

E. L. Joy

Junior Forester

INTRODUCTION

On the Upper St. Maries River Area a total of 5,134.8 acres was checked in 1932. Of this total, 1,266.8 acres was worked in 1932 and 3,868 acres in 1931. In neither case was all acres worked by Ribes eradication crews checked.

In Table No. 1 the Ribes per acre after eradication on the area worked in 1932 are shown by type.

TABLE NO. 1

RIBES PER ACRE AFTER ERADICATION IN 1932

4 PER CENT CHECK

Type	Ribes Per Acre After Eradication							
	R. petiolare		R. lacustre		R. visco.		All Species	
	Bushes	F.L.S.	Bushes	F.L.S.	Bushes	F.L.S.	Bushes	F.L.S.
Open Reproduction			1	1	1	1	2	2
Dense Pole							0	0
Open Mature			1	20			1	20
Burn (1931)							0	0
Stream	1	9	7	36			8	45
All Types	N	N	1	15	N	N	1	15

N - Negligible or less than 0.5

From Table No. 1 it is seen that the entire acreage worked in 1932 supported less than 50 feet of Ribes live stem per acre after eradication and all but the stream type was below 25 feet.

Table No. 2 shows, by type, the Ribes per acre one year after eradication on the area worked in 1931.

TABLE NO. 2

RIBES PER ACRE IN 1932 ON THE ACREAGE WORKED IN 1931
2 PER CENT CHECK

Type	Ribes Per Acre One Year After Eradication									
	R. pet.		R. iner.		R. lac.		R. vis.		All Species	
	Bu.	FLS	Bu.	FLS	Bu.	FLS	Bu.	FLS	Bu.	FLS
Open Reproduction	N	N			5	48	85	820	90	868
Dense Reproduction									0	0
Open Pole			N	N	1	12	7	53	8	65
Dense Pole					2	27	1	4	3	31
Open Mature					5	47	29	254	34	301
Cutover (grass)					6	26			6	26
Burn (1931)							3	22	3	22
Brush							17	134	17	134
Stream	34	530			40	585			74	1,115
All Types	1	8	N	N	3	35	31	292	35	335

N - Negligible or less than 0.5.

Table No. 3 which is derived from Table No. 2 shows the percentage of stream type, upland types and all types that supports not to exceed 100, 50 and 25 feet of Ribes live stem per acre.

TABLE NO. 3

ACRES GROUPED ACCORDING TO AMOUNT OF LIVE STEM
AFTER ERADICATION

Type	Percentage of Acreage Supporting Ribes Live Stem Per Acre Not Exceeding		
	100 Feet	50 Feet	25 Feet
Upland	58.8	13.7	1.4
Stream	0.0	0.0	0.0
All Types	57.9	13.5	1.4

It is apparent that only a very small part of the acreage worked in 1931 is under the 50 feet of live stem per acre limit. It is further evident that 42.1 per cent of the total area supports over 100 feet per acre. Table No. 2 shows that most of the acreage in this latter class still supports large quantities of Ribes.

COSTS

Checking cost computations for this unit were as follows:

Cost of checking.............................$481.16
Acres checked......................................5,154.9

Average cost per acre for checking = $\frac{\$481.16}{5,154.9}$ = \$0.094

COOPERATIVE LOCAL CONTROL, PRIEST LAKE TIMBER PROTECTIVE ASSOCIATION

By
Homer J. Hartman,
Junior Forester

INTRODUCTION

Cooperative Ribes eradication on the Priest Lake Timber Protective Association was continued in 1932. The work was performed under the supervision of the Division of Blister Rust Control and in cooperation with the State of Idaho. The Caribou and Trapper Creek units were selected by the Idaho State Forester as the most advantageous areas for continuing the local control program.

PURPOSE OF WORK

The purpose of the work was the local control of white pine blister rust by hand eradication of Ribes from the areas selected.

LOCATION AND DESCRIPTION OF AREAS

The Caribou and Trapper Creek working units include all of the Caribou and Trapper Creek drainages and lie within townships 63 and 64 north and ranges 3, 4 and 5 west, Boise Meridian. The areas chiefly support excellent stands of immature white pine, growing vigorously and forming the basis of a splendid timber crop. The Trapper Creek area was moderately rough while the Caribou area was very steep and in some instances presented serious problems. R. lacustre and R. viscosissimum were generally distributed over the areas; R. inerme and R. acerifolium did not occur in sufficient quantity to be of any importance.

METHODS AND EQUIPMENT

The personnel consisted of one project leader from the Division of Blister Rust Control, three 25-man camp units, one packer and a warehouseman.

Due to the Ribes species present the work was done entirely by hand pulling methods using two and three-man crews.

Both stream and upland types were worked. Areas free of Ribes and those having less than 50 feet of live stem per acre were scouted by the camp boss and were blocked out from the area to be covered by the crews.

COOPERATIVE LOCAL CONTROL, PRIEST LAKE TIMBER PROTECTIVE ASSOCIATION

By

[illegible],
Junior Forester

INTRODUCTION

Cooperative Ribes eradication on the Priest Lake Timber Protective Association was continued in [illegible]. The work was performed under the supervision of the Division of Blister Rust Control and in cooperation with the State of Idaho. The Caribou and Trapper Creek units were selected by the Idaho State Forester as the most advantageous areas for continuing the local control program.

PURPOSE OF WORK

The purpose of the work was the local control of white pine blister rust by hand eradication of Ribes from the areas selected.

LOCATION AND DESCRIPTION OF AREAS

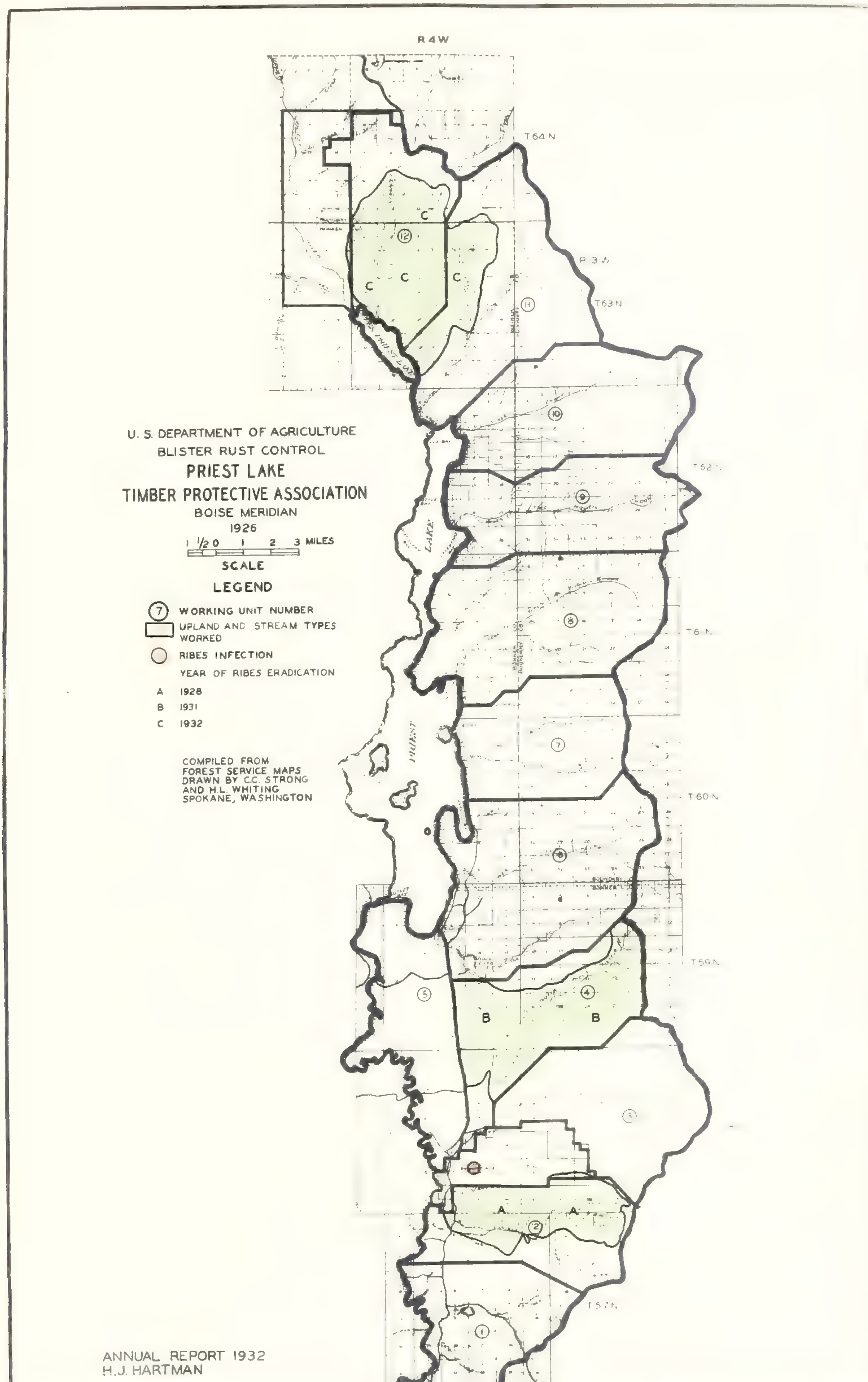
The Caribou and Trapper Creek working units include all of the Caribou and Trapper Creek drainages and lie within townships [illegible] and [illegible] north and ranges 3, 4 and 5 west, Boise Meridian. The areas chiefly support excellent stands of immature white pine, growing vigorously and forming the basis of a valuable timber crop. The Trapper Creek area was moderately rough while the Caribou area was very steep and in some instances presented serious problems. R. lacustre and R. viscosissimum were generally distributed over the areas; R. inerme and R. acerifolium did not occur in sufficient quantity to be of any importance.

METHODS AND EQUIPMENT

The personnel consisted of one project leader from the Division of Blister Rust Control, three [illegible]-man crew units, one [illegible] and a [illegible].

Due to the Ribes species present the work was done entirely by hand pulling methods using two and three-man crews.

Both stream and upland types were worked. Areas free of Ribes and those having less than [illegible] feet of live stem per acre were mapped by the camp boss and were blocked out from the area to be covered by the crews.


R 4 W
T 64 N
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U. S. DEPARTMENT OF AGRICULTURE
BLISTER RUST CONTROL
PRIEST LAKE
TIMBER PROTECTIVE ASSOCIATION
BOISE MERIDIAN
1926
1 1/2 0 1 2 3 MILES
SCALE
LEGEND
7 WORKING UNIT NUMBER
UPLAND AND STREAM TYPES WORKED
RIBES INFECTION
YEAR OF RIBES ERADICATION
A 1928
B 1931
C 1932
COMPILED FROM
FOREST SERVICE MAPS
DRAWN BY C.C. STRONG
AND H.L. WHITING
SPOKANE, WASHINGTON
PRIEST
LAKE
ANNUAL REPORT 1932
H.J. HARTMAN

ANALYSIS OF COSTS

TABLE NO. 1

STATEMENT AND ANALYSIS OF COST OF OPERATION

Item of Expenditure		Cost	
		Per Item	Total
Salaries and Wages	Permanent men	$3,341.79	
	Temporary field men	11,138.72	$14,480.51
Subsistence	Wages, cooks and flunkies	1,399.79	
	Cost of food	3,302.45	
	Transportation of food	1,118.06	5,820.30
General Equipment	Cost	67.72	
	Repairs	275.00	
	Transportation	562.52	905.24
Miscellaneous	Supplies	93.15	
	Twine	320.86	
	Transportation of temporary field men	201.80	
	Expenses of permanent men	228.16	843.97
Checking	Salaries and expenses	276.17	276.17
Grand Total			$22,326.19

Statement of Meal Costs

Total cost of subsistence..$5,820.30
Number meals served......................20,065
Average cost meal served...$.29

Statement of Composite Cost Per Effective Man Day

Total cost of operation..$22,326.19
Total number effective man days........4,456
Cost per effective man day.......................................$5.01

Cost of Checking

Salary and expense of checker....................................$276.17
Subsistence of checker...65.25
Total cost...$341.42
Cost per acre checked 17366/$341.42.............................$ .02

Statement of Expenditures by Fiscal Years

Fiscal year 1932, period 4/1/32-6/30/32..........................$6,831.62
Fiscal year 1933, period 7/1/32-3/31/33..........................15,494.57
Grand total......................................$22,326.19

W. 1076. General view of upper Trapper Creek drainage, Priest Lake Timber Protective Association. 0-30 year old stand of western white pine. Ribes occur chiefly along streams and ridges.

W. 1078. Portion of same stand as shown in above picture. Exceptional area in that Ribes occur only sparsely throughout the open reproduction stands.

WORK PERFORMED AND RESULTS

The following table gives a summary of the work accomplished:

TABLE NO. 2

INITIAL RIBES ERADICATION ON PRIEST LAKE TIMBER PROTECTIVE ASSOCIATION

Working Unit No.	Type	Acres	Man Days	Number of Ribes Pulled: R. lac.	R. vis.	R. iner.	R. cer.	Total Ribes	Total Cost	Per Acre Basis: Man Days	Ribes	Cost
11	O.F.	2,964	777	136,895	37,791		3	174,689	$ 3,893.06	.26	59	$1.31
	D.R.	355	162	36,462	19,202			55,664	811.68	.46	157	2.29
	O.P.	79	19	2,805	1		3	2,809	95.30	.24	36	1.21
	O.M.	1,346	345	136,030	5,741		291	142,062	1,778.57	.28	114	1.39
	D.M.	14	5	1,368				1,368	25.05	.36	98	1.79
	All Upland Types	4,658	1,308	333,560	122,735		297	456,593	$ 6,553.56	.28	98	$1.41
	Stream	183	76	20,516	794	33		21,343	380.79	.42	117	2.08
	All Types	4,841	1,384	354,076	123,529	33	297	477,954	$ 6,934.35	.29	99	$1.43
12	O.F.	7,251	1,463	116,666	129,933			246,599	7,330.16	.20	34	1.01
	D.R.	405	135	6,873	7,576			14,449	676.40	.33	36	1.67
	O.P.	4	1	162	10			172	5.01	.25	43	1.25
	O.M.	2,967	897	128,721	3,435		31	132,187	4,494.30	.30	45	1.51
	D.M.	354	113	21,553	836			22,389	556.17	.13	63	.66
	All Upland Types	11,481	2,609	273,975	141,790		31	415,796	$13,072.04	.23	36	$1.14
	Stream	1,044	463	133,049	5,888	196		139,133	2,319.80	.44	133	2.22
	All Types	12,525	3,072	396,034	147,678	196	31	543,929	$15,391.84	.25	43	$1.23
All Units	O.F.	10,215	2,240	273,561	227,723		3	501,380	10,773.22	.22	49	1.05
	D.R.	760	297	43,335	26,778			70,113	1,488.08	.39	92	1.96
	O.P.	83	20	2,967	11		3	2,981	100.21	.24	36	1.21
	O.M.	4,313	1,242	264,751	9,176		322	274,249	6,322.87	.29	65	1.46
	D.M.	368	118	22,921	836			23,757	581.22	.16	27	.68
	All Upland Types	16,139	3,917	607,535	264,525		328	872,388	$19,615.60	.24	54	$1.22
	Stream	1,227	539	141,565	6,682	228		149,475	2,700.59	.44	122	2.20
	All Types	17,366	4,456	750,100	271,207	228	328	1,021,863	$22,316.19	.26	59	$1.29

RECOMMENDATIONS

During the summer of 1932 Doctor E. E. Hubert found a Ribes infection on the Benton Creek drainage of the Priest Lake Experiment Station area which lies within the boundaries of the Priest Lake Timber Protective Association. The rapid spread of the rust is certain, and every possible effort should be made to increase the operations so as to complete the initial Ribes eradication over the Association area at the earliest date possible.

[illegible]

During the season of [illegible] Inspector [illegible] found a [illegible] infection in the [illegible] [illegible] within the boundaries of the [illegible] Protective Association. The rapid spread of the rust is certain, and every possible effort should be made to increase the operations so as to complete the initial Ribes eradication over the Association area at the earliest date possible.

CHECKING AFTER RIBES ERADICATION, PRIEST LAKE TIMBER PROTECTIVE ASSOCIATION

By
E. L. Joy
Junior Forester

On the Priest Lake Timber Protective Association a total of 22,331 acres was checked. Of this total 8,194 acres were worked in 1932, 13,151 acres in 1931, and 974 acres in 1928.

The 1932 work on the Trapper and Caribou Creek drainages and the 1931 work on the North Fork of East River drainage were given a 2 per cent cruise. On the third area, a portion of the Big Creek drainage where Ribes eradication was done in 1928, a 4 per cent check was made.

In Table No. 1 the Ribes per acre after eradication in 1932 are shown by types for each of the 3 camps.

TABLE NO. 1

RIBES PER ACRE AFTER ERADICATION IN 19[illegible], 2 PER CENT CHECK

Camp	Type	Ribes Per Acre After Eradication							
		R. iner.		R. lac.		R. vis.		All Species	
		Bu.	L.S.	Bu.	L.S.	Bu.	L.S.	Bu.	L.S.
1	O.R.			N	4	2	9	2	13
	D.R.			N	23	N	1	1	24
	O.F.			1	12			1	12
	D.F.							0	0
	O.M.			5	41	1	4	6	45
	D.M.							0	0
	Brush					2	7	2	7
	Alpine			4	28			4	28
	Alder			17	67			17	67
	Meadow							0	0
	Stream			9	316			9	316
All Types				1	11	1	8	2	19
2	O.R.			3	43	4	42	7	85
	D.R.					3	21	3	21
	O.F.			25	600	50	375	75	975
	D.F.							0	0
	O.M.			5	58	N	1	6	59
	Brush			11	159	22	380	33	539
	Alpine			9	99	N	N	9	99
	Alder			13	64	4	43	17	107
	Rock			9	50			9	50
	Meadow							0	0
	Stream			14	91			14	91
All Types				6	58	2	19	7	77
3	O.R.			13	84	34	186	47	270
	D.R.			9	32	12	74	21	106
	O.F.			7	7			7	7
	O.M.			6	56			6	56
	D.M.							0	0
	Brush			46	657			46	657
	Alpine							0	0
	Rock			6	33	3	15	9	48
	Stream			7	68			7	68
All Types				8	64	4	24	12	88
All Camps	O.R.			2	14	3	22	5	36
	D.R.			2	21	3	18	5	39
	O.F.			2	17	1	4	3	21
	D.F.							0	0
	O.M.			6	55	N	1	6	56
	D.M.							0	0
	Brush			21	311	5	61	26	372
	Alpine			8	88	N	N	8	88
	Alder			13	64	4	37	17	101
	Rock			7	36	2	12	9	48
	Meadow							0	0
	Stream			10	182			10	182
All Types				3	34	2	14	5	48

N - Negligible or less than 0.5

Checkers included variations in types not recognized in Ribes eradication methods.

Table No. 2, which is derived from Table No. 1, shows the percentage of stream type, upland types, and all types that supported not to exceed 100, 50 and 25 feet of Ribes live stem per acre.

TABLE NO. 2

ACRES GROUPED ACCORDING TO AMOUNTS OF LIVE STEM AFTER ERADICATION

	Per Cent of Acreage with Ribes Live Stem Per Acre Not Exceeding		
Type	100 Feet	50 Feet	25 Feet
Upland	96.5	55.7	60.9
Stream	87.0	0.0	0.0
All	95.9	34.8	50.0

In Table No. 2 it is found that a very large percentage of the total acreage supports less than 100 feet per acre but only about 55 per cent less than 50 feet. This is chiefly due to a large acreage of mature timber supporting 100 feet of Ribes lacustre per acre that was not reworked because it is believed that the natural reduction of Ribes by shading will progress rapidly enough to materially reduce this amount of live stem.

Table No. 3 shows by types the Ribes per acre on this area one year after eradication.

TABLE NO. 3

RIBES PER ACRE PER YEAR AFTER ERADICATION ON ACREAGE WORKED IN 1931, 2 PER CENT CHECK

Type	Ribes Left Per Acre							
	R. iner.		R. lac.		R. vis.		All Species	
	Bu.	F.L.S.	Bu.	F.L.S.	Bu.	F.L.S.	Bu.	F.L.S.
O.R.			30	570	19	137	49	707
D.R.	N	2	35	504	9	93	44	599
O.P.	N	1	N	2	1	6	1	9
D.P.	N	1	2	12	5	11	7	24
O.M.	1	15	7	91	N	3	8	109
D.M.	N	1	4	30	N	3	4	34
Brush			9	139	15	132	24	271
Sub-Alpine			4	8			4	8
Cut-O.			1	1	26	10	27	11
Barren			137	3,039			137	3,039
Meadow	1	17	4	15			5	32
Stream	11	112	73	1,159	1	10	85	1,281
All Types	N	2	8	116	3	16	11	140

N - Negligible or less than 0.5.
Checkers included variations in types not recognized in Ribes eradication records.

Table No. 4, derived from Table No. 3, gives the percentage of stream type, upland types and all types that supported not to exceed 100, 50 and 25 feet of Ribes live stem per acre.

TABLE NO. 4

ACRES GROUPED ACCORDING TO AMOUNT OF LIVE STEM AFTER ERADICATION

Type	Per Cent of Acreage With Ribes Live Stem Per Acre Not Exceeding		
	100 Feet	50 Feet	25 Feet
Upland	86.2	66.0	48.4
Stream	0.0	0.0	0.0
All	84.2	64.5	47.3

Comparing Tables No. 4 and No. 2, it is seen that the 1931 worked area had 11.7 per cent less acreage in the 100-foot per acre classification but 9.7 per cent more in the 50-foot. The difference in the amount of acreage in the 25-foot class was only 2.7 per cent in favor of the 1932 work.

In 1928 Ribes eradication work was done on a total of 2,487 acres in the Big Creek and Fox Creek drainages. As a study of the Ribes conditions on this area 4 years after eradication, a 4 per cent check was made of 974 acres. Table No. 5 shows the results of this check.

In this table it is notable that 75.2 per cent of the area had not over 50 feet of Ribes live stem per acre and 64.7 per cent had 25 feet or less. This indicates that the present protection status of the 1928 work is better than that of either the 1931 or 1932 work in the Priest Lake region.

TABLE NO. 5

RIBES PER ACRE 4 YEARS AFTER ERADICATION ON THE AREA WORKED IN 1928, 4 PER CENT CHECK

	Ribes Per Acre							
	R. iner.		R. lac.		R. vis.		All Species	
Type	Bu.	F.L.S.	Bu.	F.L.S.	Bu.	F.L.S.	Bu.	F.L.S.
O.S.	4	83	2	12	10	84	16	179
D.S.	2	38	4	25			6	63
O.P.							0	0
D.P.							0	0
O.M.	1	13	1	6	T	1	2	20
D.M.							0	0
Brush	18	118			1	20	19	138
C.O.	T	T	5	30	1	10	6	40
Meadow	2	8					2	8
Stream	31	403	19	423			50	826
All	4	46	3	44	1	10	8	100

COSTS

The checking cost computations for the Priest Lake Timber Protective Association area are as follows:

Cost of checking........................$341.42
Area reported in eradication report.. 17,366
Average cost per acre for checking 341.42 / 17366 = $.020

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Areas worked in 1931 and 1928 (training camp);

Salaries (21 men)	$946.11
Expenses	115.24
Subsistence	257.39
Total (charged to project 4.2)	$1,318.74

Area reported in eradication report 1931 = 11,068
Area worked in 1928 and checked in 1932 = 974
Total area checked.......... 12,042

Average cost per acre for checking $\frac{\$1,318.74}{12,042} = \$0.109$

Deductions were made from the total training camp costs for scouting and checking of the Savenac nursery. The latter was conducted by four men during the last few days of the training period.

SCOUTING FOR BLISTER RUST IN THE INLAND EMPIRE

By

E. L. Joy,

Junior Forester

INTRODUCTION

Scouting during previous years has shown that blister rust on Ribes or on pines is scattered over practically the entire Inland Empire which pine region. The most serious invasion of the disease has occurred in the southern part of this region coincidental with the occurrence of Ribes petiolare. Scouting in 1932 has shown that the region just north of the main R. petiolare zone now has a few scattered pine infection centers.

PURPOSE

The purpose of scouting is to determine the extent and intensity of the disease.

LOCATION OF WORK

In 1932 systematic scouting was conducted on the Kaniksu and Coeur d'Alene National Forests. Random scouting on other north Idaho forest areas was performed throughout the season by both the permanent and temporary men in conjunction with their regular assignments.

RESULTS

Previous to 1932, a total of 61 pine infection centers had been located in the Inland Empire, 11 of which probably originated in 1923, the year in which the disease entered this region. The location and data for each of the 61 centers is given on page 175 to 179 of the 1931 Annual Report.

In 1932, 16 additional centers were found, only one of which originated in 1923. Thus the total known pine infection centers is now 77 and the total that originated in 1923 is 12.

Table No. 1 is a tabulation of the location and data for each of the 16 centers found in 1932.

SCOUTING FOR BLISTER RUST IN THE INLAND EMPIRE

By

[illegible]

Junior Forester

INTRODUCTION

[illegible]

OBJECT

The purpose of scouting is to determine the spread and intensity of the disease.

SCOUTING IN 1932

In 1932 systematic scouting was conducted on the Kaniksu and Coeur d'Alene National Forests. [illegible] scouting on [illegible] areas was performed throughout the season by both the permanent and temporary men in conjunction with their regular assignments.

RESULTS

Previous to 1932, a total of 61 pine infection centers had been located in the Inland Empire, 11 of which [illegible] the year in which the disease [illegible]. For each of the 61 centers [illegible] is given on [illegible] of the 1931 Annual Report.

In 1932, 15 additional centers were found, only one of which originated in 1932. Thus the total known [illegible] and the total that originated in 1923 is 12.

Table No. 1 is a tabulation of the location and data for each of the 16 centers found in 1932.

TABLE NO. 1

PINE INFECTION CENTERS FOUND IN THE INLAND EMPIRE, 1932

County	Location	T.	R.	Sec.	Extent of Area: Length	Extent of Area: Width	Pine Data: Age	Pine Data: No. Per Acre	Pine Data: No. Exam.	Pine Data: No. Inf.	Pine Data: Per Cent Inf.	No. of Cankers	Probable Year of Origin	Associated Ribes
St. Joe National Forest														
Shoshone	Bougie Cr.	47N	5E	15	Spot		11-20	75	25	1	4	1	1927-28	R.pet. R.lac.
Shoshone	St. Maries Riv.	43N	1E	36	Spot		41-60	400	25	1	4	2	1927	R.iner. R.lac. R.vis.
Benewah	Olson Cr.	43N	1E	16	Spot		41-60	150	50	2	4	2	1929	R.pet. R.vis. R.lac.
Benewah	Crystal Cr.	43N	1E	29, 30, 31	1 mile	2 Ch.	11-20	50	100	26	26	26	1927	R.pet. R.iner. R.lac.
Coeur d'Alene National Forest														
Shoshone	Rock City A.S.	50N	2E	29	Spot		11-40	400	300	1	1	1	1926-29	R.iner.
Shoshone	Emery Cr.	53N	3E	33	Spot		11-30	100	250	10	4	20	1929	R.iner. R.lac.
Shoshone	VanBoosier Cr.	52N	[illegible]	30	Spot		11-40	50	475	1	1	1	1928-29	R.iner. R.lac.
Shoshone	Scott Cr.	52N	3E	24	Spot		1-20	100	400	3	1	10	1926-27	R.vis. R.iner. R.lac. R.irrig.
Kootenai	Burnt Cabin Cr.	51N	1W	7, 8, 17, 18	2 miles	10-20 Ch.	11-40	100	?	?	50	?	1923	R.iner. R.vis. R.lac.
Clearwater Timber Protective Association														
Clearwater	Oxford R.S.	38N	7E	31	10 Ch.	4 Ch.	11-40	400	25	[illegible]	10	18	1927	R.pet. R.lac.
Clearwater	Trail Cr.	37N	6E	10	20 Ch.	2 Ch.	11-40	300	300	16	5	24	1927	R.pet. R.lac.
Clearwater	Alder Cr.	38N	5E	9	10 Ch.	5 Ch.	11-60 61-100	400	100	[illegible]	10	48	1927	R.pet. R.lac.
Clearwater National Forest														
Clearwater	Quartz Cr.	40N	8E	22	10 Ch.	10 Ch.	11-40	500	85	25	30	7	1927	R.vis. R.lac.
Clearwater	Skull Cr.	41N	8E	24	Spot		11-40	?	?	1	1	1	1927	R.pet. R.lac.
Clearwater	N. Fk. Clearwater Riv.	40N	8E	15	Spot		11-40	?	?	1	1	1	1927	R.pet. R.lac.
Clearwater	Quartz Cr.	40N	8E	15	Spot		11-40	?	?	2	1	2	1927	R.pet. R.lac.

It is seen from Table No. 1 that five new centers were found on the Coeur d'Alene National Forest. All of these are outside of the region in which R. petiolare occurs. Within this region were found 11 new centers.

During the summer a large portion of the Kaniksu National Forest and Priest Lake Timber Protective Association area was scouted. No pine infection and only one Ribes infection was found, that being on a single leaf of R. viscosissimum. This infection was located along Benton Creek east of the Benton Ranger Station.

It is evident that within the R. petiolare region pine infection centers are abundant and rapidly increasing in number. In contrast, on the Coeur d'Alene National Forest, immediately adjacent to the R. petiolare region, there has been found a total of only seven, and farther north on the Kaniksu National Forest, none.

Ribes infections were found in two localities where it has not been located previously. One is along the Palouse River in the Palouse Division of the St. Joe National Forest and the other is along the Lochsa River near the Powell Ranger Station on the Selway National Forest. The following is a list of the points outside the general region known to have abundant pine infection where Ribes infections were found in 1932.

Kaniksu National Forest

1. Benton Creek, T. 58 N., R. 4 W., Sec. 26. Infection on R. viscosissimum.

Palouse Division of the St. Joe National Forest

1. South Fork of the Palouse River, T. 42 N., R. 2 W., Sec. 28. Infection on R. lacustre.

2. South Fork of the Palouse River, T. 42 N., R. 2 W., Sec. 26. Infection on R. inerme.

3. South Fork of the Palouse River, T. 42 N., R. 2 W., Sec. 28. Infection on R. inerme.

Selway National Forest

1. Lochsa River, T. 37 N., R. 14 E., Sec. 30. Infection on R. petiolare.

2. Lochsa River, T. 37 N., R. 14 E., Sec. 32. Infection on R. petiolare.

BLISTER RUST CONTROL WORK IN WASHINGTON
1932

Blister rust control activities in Washington were continued as a cooperative project between the Bureau of Plant Industry and the Washington State Department of Agriculture. There is given below the amendment to the basic memorandum of understanding, which was drawn up to cover the cooperative work for the fiscal year 1932 beginning July 1, 1932:

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective July 1, 1927
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY
and the
WASHINGTON STATE DEPARTMENT OF AGRICULTURE

Cooperative Work in Controlling White Pine Blister Rust in Washington.

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry and the Washington State Department of Agriculture effective July 1, 1927, to continue in effect until June 30, 1928, shall be continued in full force and effect in all its provisions for the fiscal year ending June 30, 1933, with the exception of paragraphs C-1 and C-6 which shall be amended to read as follows:

C-1. That this memorandum of understanding shall take effect July 1, 1932, and continue in effect until June 30, 1933, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

C-6. That for the fiscal year July 1, 1932, to June 30, 1933, the Washington State Department of Agriculture will expend about $4,000.00 and the Federal Government in behalf of the United States Department of Agriculture, Bureau of Plant Industry about $7,000.00 in connection with the work herein provided for.

April 11, 1933 E. F. Banker
Director, Washington State Department of Agriculture

April 19, 1933 Wm. A. Taylor
Chief, Bureau of Plant Industry, U. S. D. A.

SBD

BLISTER RUST CONTROL ACTIVITIES, MOUNT RAINIER NATIONAL PARK

By
M. C. Riley,
Junior Forester

INTRODUCTION

Control activities, initiated in 1930, were continued during the 1932 field season and consisted of Ribes eradication and reeradication, checking of the Ribes eradication work, scouting for white pine blister rust and an infection survey on one area.

The Division of Blister Rust Control supplied the necessary general supervision for all of these activities.

RIBES ERADICATION

Purpose of the Work:

The purpose of this portion of the program was to complete the eradication of Ribes over an area sufficient to insure protection to the designated white pine stands on the basis of what is now known regarding the width of protection zone necessary.

Location and Description of Areas:

Ribes eradication was performed on three areas during 1932. Although it was considered that initial Ribes eradication had been completed on the Longmire-Silver Forest area, it was later decided to extend the protection zone in some instances to conform to an extension of the area to be protected. The location and description of this area has been given in previous reports.

The two new areas designated for initial Ribes eradication are known as the Muddy Fork Cowlitz and Starbo areas. On the Muddy Fork Cowlitz are approximately 1,750 acres of western white pine 20-40 years of age. Over a large portion of the area white pine is apparently the climax type. The soil is pumice and generally supports no vegetation except white pine and ferns. There is no duff on the ground but some of the more moist sites contain alder and willow. *Ribes bracteosum* and *R. lacustre* were prevalent along the streams. No Ribes were found on the hillsides with the exception of a few scattered *R. lacustre* in association with the alder and willow. Infection is present on white pine and Ribes.

W. 1142. General view of Muddy Fork Cowlitz area, Mount Rainier National Park. White pine 20-40 years old with heavy <u>R. bracteosum</u> concentrations in stream type.

W. 1137. Portion of same stand as shown in picture above. No Ribes are found on the hillsides in this area.

The Starbo area consists of approximately 420 acres of 30-40 year old white pine along with some scattered clumps of white bark pine. <u>Ribes acerifolium</u> and <u>R. lacustre</u> were the predominating species and they were generally distributed over the area, being especially dense in places where snowslides had removed the timber from narrow strips along the north side of White River. Much scouting failed to show any infection present.

<u>Methods and Equipment:</u>

As in previous years, all Ribes eradication work was done by the hand pulling method. The three man crew was used whenever the number of men available permitted. In addition to eradicating all Ribes from the actual area to be protected, <u>R. bracteosum</u> was removed for a distance of one mile from the white pine stands and other Ribes species were removed for a distance of one-quarter mile.

<u>Results of Work:</u>

The following table gives the results of all initial Ribes eradication for the 1932 field season:

TABLE NO. 1

RIBES ERADICATION SUMMARY, MOUNT RAINIER NATIONAL PARK, 1932

Area	Eradication Type	Acres	Man Days	Total Ribes Pulled: R. brac.	R. lac.	R. lax.	R. acer.	R. visco.	R. wat.	R. sang.	Total	Acreage Basis: Ribes	Man Days	Cost
Muddy Fork Cowlitz	Str.	383	1,120.4	110,649	27,181	338	11	5	-	19	138,202	360.8	2.93	$17.90
Totals or Averages		383	1,120.4	110,649	27,181	338	11	5	-	19	138,202	360.8	2.93	$17.90
	Str.	46	46.5	-	2,663	546	409	575	476	-	4,669	101.5	1.01	$ 6.17
	O.R.	48	21.0	-	68	-	2,305	7	7	-	2,387	49.7	.44	2.69
Starbo	O.P.	332	261.5	-	11,276	3,221	16,658	6,131	6,723	-	44,009	132.6	.79	4.83
Totals or Averages		426	329.0	-	14,007	3,767	19,372	6,713	7,206	-	51,065	119.9	.77	$ 4.70
	Str.	38	71.9	1,471	6,431	387	1,366	-	-	-	9,655	254.1	1.89	$11.55
Longmire	O.R.	9	6.0	-	919	19	-	-	-	-	938	104.2	.67	4.09
Totals or Averages		47	77.9	1,471	7,350	406	1,366	-	-	-	10,593	225.4	1.66	$10.14
Grand Totals or Averages		856	1,527.3	112,119	48,538	4,511	20,749	6,718	7,206	19	199,860	233.5	1.78	$10.88

Str. - Stream type
O.R. - Open Reproduction
O.P. - Open Pole

The figures given in Table No. 1 apply only to the acreage actually worked, whereas the acreage afforded initial protection is considerably in excess of this figure, especially on the Muddy Fork Cowlitz area where it was necessary to work only the stream type. No figure can be given for acreage afforded initial protection since the work on the area is not completed.

Initial Ribes eradication has not been completed on the Muddy Fork Cowlitz area. The amount of money allotted for this area would have completed the work but no money was appropriated for the additional equipment needed and it was also necessary to spend some of the funds for trail maintenance in order to transport camp equipment as early as required. Money for Ribes reeradication work also came from the Muddy Fork Cowlitz allotment.

Checking:

Temporary check strips, on the basis of a ½ per cent check, were run on all areas where Ribes eradication has been performed. The check of the work on the Longmire area was made after Ribes reeradication; on the Sunrise area one year after initial working, and on the Muddy Fork Cowlitz and Starbo areas the check was made the same year as the original Ribes eradication. Results of these checks are shown in Table No. 2.

TABLE NO. 2

RESULTS OF CHECKING
MOUNT RAINIER NATIONAL PARK
1932

Area	Eradication Type	Acres Checked	Live Stem Per Acre							
			R. brac.	R. lac.	R. lax.	R. acer.	R. visco.	R. wat.	R. sang.	Total
Longmire	Stream	655	3.7	12.2	7.9	-	-	-	-	23.8
	O.R.	397	1.4	9.9	-	17.0	-	-	7.4	35.7
Sunrise	Stream	475	7.0	28.8	12.4	-	-	5.5	-	53.7
	O.R.	50	-	36.5	-	3.6	.7	11.6	2.1	54.5
	O.P.	321	-	14.9	-	25.7	-	14.1	.1	55.8
Muddy Fork Cowlitz	Stream	383	39.7	4.2	-	-	-	-	-	43.9
Starbo	Stream	47	-	16.2	12.9	.3	1.1	-	-	30.5
	O.R.	21	-	-	26.8	10.1	-	12.3	-	48.9
	O.P.	262	-	12.6	.7	29.2	-	16.0	-	58.5

REERADICATION

This work was conducted on the stream type of the Lonepine-Silver Forest area where original Ribes eradication had been performed during the 1930 and 1931 field seasons. The work was done by the hand pulling method and the three man crew was used.

The results of the Ribes reeradication work are tabulated as follows:

TABLE NO. 3

SUMMARY OF STREAM TYPE RIBES REERADICATION
MOUNT RAINIER NATIONAL PARK
1932

			Seedlings			Sprouts								Others							
			R. brac.	R. lac.	R. lax.	R. brac.		R. lacustre		R. laxi.		R. sang.		R. brac.		R. lacustre		R. laxi.		R. acer.	
	Acres	Man Days	No.	No.	No.	No.	FLS.	No.	FLS.	No.	FLS.	No.	FLS.	No.	FLS.	No.	FLS.	No.	FLS.	No.	FLS.
Totals	421.2	189.1	9720	7631	1023	4670	7779	5663	8117	1293	3157	3	7	579	2401	1711	6688	230	1530	3	50
Per Acre		.45	23.1	18.1	2.4	11.1	18.5	13.4	19.3	3.1	7.5	-	-	1.4	5.7	4.1	15.9	.5	3.6	-	-
Average feet of live stem per bush							1.7		1.4		2.4		2.3		4.1		3.9		6.7		16.7

Feet live stem per acre = Sprouts 45.3, Other 25.2, Total 70.5. Cost per acre = $2.75.

Series W. 85. Series of pictures taken at Narada Falls, Mount Rainier National Park, showing portion of the Longmire-Silver Forest area. R. bracteosum in upper picture eradicated in early September 1930. Center picture, taken in July, 1931 shows a few R. bracteosum sprouts. Reeradication was conducted in September, 1931. Lower picture, taken in July, 1932 shows original Ribes ground cover replaced by salmon berry (Rubus) and Menziesii.

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The acreage in the table above does not correspond with the total acreage for the area since some portions did not support sufficient Ribes growth to necessitate reeradication. The initial Ribes eradication required 1.9 man days per acre or an average cost of $11.85 per acre.

COST ANALYSIS

The following table lists the total expenditures:

TABLE NO. 4

STATEMENT OF COST OF OPERATION
MOUNT RAINIER NATIONAL PARK
1932

Item of Expenditure		Cost Per Item	Cost Total
Salaries and Wages	Supervision	$1,293.82	
	Temporary Laborers	8,455.23	$ 9,748.05*
Equipment	Total Cost	314.47	
	Transportation	60.00	
	Servicing	47.90	419.37
Miscellaneous	Subsistence Packing	144.50	
	Truck Rental and Operation	117.20	
	Twine	40.95	
	Freight	15.73	318.38
Grand Total			$10,486.40

*Subsistence at $.40 per meal included in this item.

Funds expended by the Division of Blister Rust Control are represented by the items for supervision, twine and freight. Figures in Table No. 4 give a cost of $6.11 per effective man day.

SCOUTING

In an effort to locate new infection centers, scouting was carried on in and around all major white pine stands and was also conducted on all of the drainages outside of the park where it was felt that the presence of infection would jeopardize stands in which the National Park Service was interested. No new infection centers were found.

The acreage in the table above does not correspond with the total acreage for the area since some portions did not support sufficient Ribes growth to necessitate [illegible]. The initial Ribes eradication required 1.9 man days per acre or an average cost of $11.85 per acre.

COST ANALYSIS

The following table [illegible]

TABLE NO. 4

STATEMENT OF COST OF OPERATION
MOUNT RAINIER NATIONAL PARK
[illegible]

Item of Expenditure		Cost: Per Item	Cost: Total
Salaries and wages	Supervision	$1,2[illegible].42	
	Temporary Laborers	8,455.23	$ 9,748.65*
Equipment	Total Cost	214.17	
	Transportation	60.00	
	Servicing	42.50	418.[illegible]
Miscellaneous	Subsistence Camping	144.[illegible]	
	Truck Rental and Operation	117.[illegible]	
	Twine	40.[illegible]	
	Freight	15.72	218.33
Grand Total			$10,[illegible]

*Subsistence at $.40 per meal included in this item.

Funds expended by the Division of Blister Rust Control are represented by the items for supervision, twine and freight. Figures in Table No. 4 give a cost of $5.11 per effective man day.

SCOUTING

In an effort to locate new infection centers, scouting was carried on in and around all major white pine stands and [illegible] of the drainages outside of the [illegible] infection would jeopardize stands in which the National Park Service was interested. No new infection centers were found.

INFECTION SURVEY

Infection is general over the Muddy Fork Cowlitz area but random scouting had failed to locate any infection centers. A survey was conducted on the area to determine the infection centers with the idea that the location and extent of these centers might have a bearing upon the Ribes eradication work which was in progress at the time but which could not be completed during the current field season since sufficient funds were not available.

Strips 13.2 feet wide and 10 chains apart were run at right angles to the course of the streams and all white pine trees on these strips were examined. The strips did not cross each other and did not extend beyond the limits of the white pine type and they represent a study of 2 per cent of an area of approximately 1,100 acres. A canker analysis was made for each infected tree and the location of that tree on the strip was recorded.

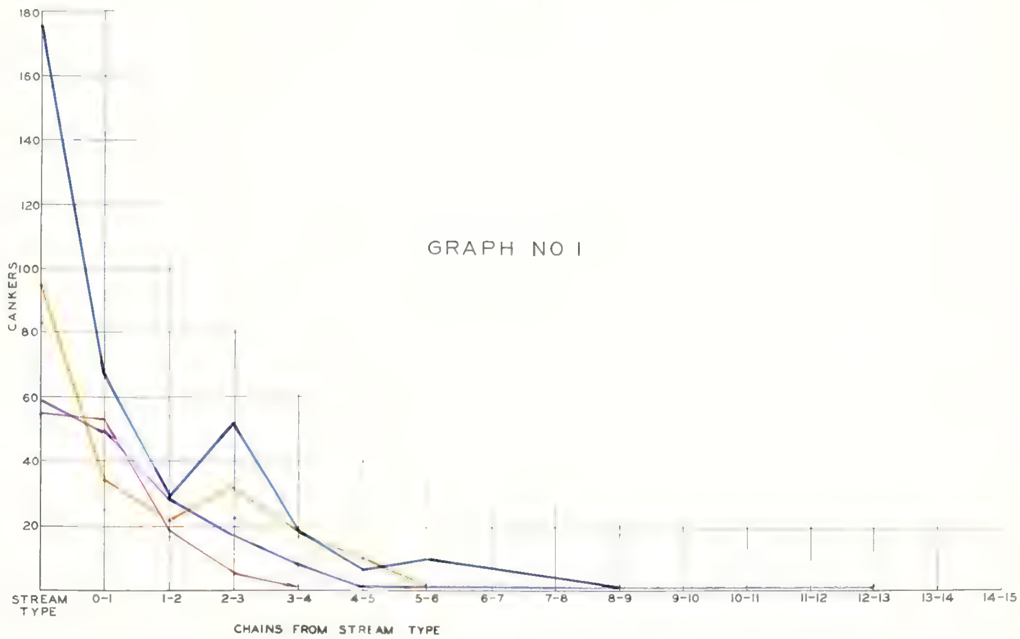
The following table and graphs show the data obtained. Graph No. 1 shows the same data as presented in Table No. 5, while Graph No. 2 shows the data plotted according to the distance from the stream itself regardless of stream type. The difference between the two graphs represents a more detailed plotting of the cankers in the stream type.

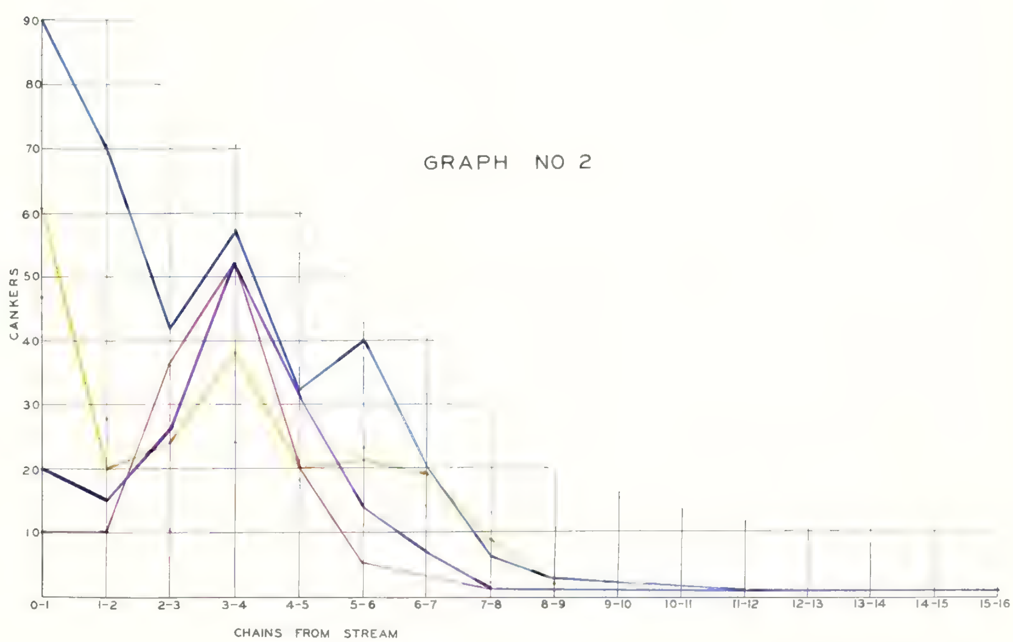
INFECTION SURVEY

MUDDY FORK COWLITZ AREA

MOUNT RAINIER NATIONAL PARK

1932





LEGEND

- FIRST SYMPTOMS JUVENILE
- FIRST PYCNIA
- FRUITED ONCE
- FRUITED SEVERAL TIMES

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TABLE NO. 5

SUMMARY OF INFECTION SURVEY DATA, MUDDY FORK-COWLITZ AREA
MOUNT RAINIER NATIONAL PARK
1932

Chains From Stream Type	Chains Studied	Number Infected Trees	Canker Analysis: First Symptom Total	First Symptom Per Tree	Juvenile Total	Juvenile Per Tree	First Pycnia Total	First Pycnia Per Tree	Fruited Once Total	Fruited Once Per Tree	Fruited Several Total	Fruited Several Per Tree	Total Total	Total Per Tree	Per Cent Infected Trees	Per Cent Total Cankers Found
0	89	78	176	2.3	83	1.1	95	1.2	59	.8	55	.7	468	6.0	53	45
1	46	19	67	3.5	25	1.3	34	1.8	49	2.6	53	2.8	228	12.0	11	22
2	46	13	32	2.5	17	1.3	22	1.7	31	2.4	19	1.5	121	9.3	9	12
3	45	14	52	3.7	22	1.6	32	2.3	17	1.2	5	.4	128	9.2	10	12
4	42	11	19	1.7	17	1.5	19	1.7	8	.7	1	.1	64	5.8	8	6
5	38	3	6	2.0	1	.3	10	3.3	1	.3	-	-	18	6.0	2	1
6	36	3	8	2.7	1	.3	2	.7	-	-	-	-	11	3.7	2	1
7	34	1	-	-	-	-	-	-	1	1.0	-	-	1	1.0	1	-
9	30	1	1	1.0	1	1.0	-	-	-	-	-	-	2	2.0	1	-
13	18	1	-	-	-	-	-	-	1	1.0	-	-	1	1.0	1	-
Total	-	144	351	2.5	168	1.2	214	1.5	167	1.2	133	.9	1,033	7.2	100	100

In Table No. 5 the data taken in the stream type are represented by "0" in the column headed "Chains from Stream Type." The width of stream type crossed by the strips varied with a maximum of eleven chains. Ribes bracteosum was the prevailing species with some R. lacustre in mixture and there were no Ribes outside of the stream type. The area is reasonably uniform in pine distribution. This table shows no infected trees more than 13 chains from stream type although the strips were extended a maximum distance of 26 chains. Random scouting has disclosed all stages of cankers at greater distances from stream type although the strips did not locate any of these.

As a result of this survey two infection centers were found. One of these centers was directly on a strip and the other was located through the preponderance of cankers found on two other adjoining strips. Both of these centers were approximately three chains from stream type which accounts for the peak on the graphs at that point. A graph showing cankers per infected tree would give a peak at the same place although it would be less pronounced and the relation of one stage of cankers to another would not be the same.

SUMMARY

During the 1932 field season Ribes eradication was performed on 856 acres at an average cost of $10.60 per acre. Checking was done on all areas where Ribes eradication had been performed. Ribes reeradication on 421.2 acres resulted in removing 70.5 feet of live stem per acre at an average cost per acre of $2.78 as compared with $11.86 per acre for initial Ribes eradication on the same area. Scouting was conducted on all important areas. An infection survey was made on a portion of the Muddy Fork Cowlitz area.

In Table No. 5 the data taken in the stream type are represented by [illegible] The [illegible] of stream type [illegible] *Ribes bracteosum* was the prevailing species with some *R. lacustre* in mixture and there were no Ribes outside of the stream type. The area is reasonably uniform in pine distribution. This table shows no infected trees more than 12 chains from stream type although the strips were extended a maximum distance of [illegible] at greater distances from stream type although the strips did not locate any of these.

As a result of this survey two infection centers were found. One of these centers [illegible] the preponderance of cankers found on two other adjoining strips. Both of these centers were approximately three chains from stream type which accounts for the peak on the graphs at that point. A graph showing cankers per infected tree would give a peak at the same place although it would be less [illegible] not be the same.

[illegible]

During the 1933 field season Ribes eradication was performed on [illegible] all areas where Ribes eradication had been performed. Ribes reeradication on 421.2 acres resulted in removing 70.5 feet of live stem per acre at an average cost per acre of $2.75 as compared with $11.35 per acre for initial Ribes eradication on the same area. [illegible]

BLISTER RUST CONTROL WORK IN OREGON
1932

Blister rust control activities in Oregon were continued as a cooperative project between the Bureau of Plant Industry and the Bureau of Plant Industry of the State Department of Agriculture, the Oregon State Board of Forestry and the Oregon State College. There is given below the amendment to the basic memorandum of understanding, which was drawn up to cover the cooperative work for the fiscal year 1932 beginning July 1, 1932.

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective July 1, 1927
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY, THE OREGON STATE BOARD OF HORTICULTURE, OREGON STATE BOARD OF FORESTRY, AND THE OREGON STATE COLLEGE

Cooperative Work in Controlling White Pine Blister Rust in Oregon.

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry and the Oregon State Board of Horticulture, Oregon State Board of Forestry and the Oregon State College effective July 1, 1927 to continue in effect until June 30, 1928, shall be continued in full force and effect in all its provisions for the fiscal year ending June 30, 1933 with the exception of paragraphs E-1 and E-6 which shall be amended to read as follows:

E-1. That this memorandum of understanding shall take effect July 1, 1932 and continue in effect until June 30, 1933, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

E-6. That for the fiscal year July 1, 1932 to June 30, 1933 the Oregon State Board of Horticulture will expend about $3,500.00; the Oregon State Board of Forestry will expend about $1,000.00; the Oregon State College will expend about $1,750.00; and the Federal Government in behalf

BLISTER RUST CONTROL WORK IN OREGON

1932

Blister rust control activities in Oregon were continued in a cooperative project between the Bureau of Plant Industry and the Division of Plant Industry of the State Department of Agriculture, the Oregon State Board of Forestry and the Oregon State College. There is given below the amendment to the basic memorandum of understanding which was drawn up to cover the cooperative work for the fiscal year 1933 beginning July 1, 1932.

AMENDMENT TO

MEMORANDUM OF UNDERSTANDING

Effective July 1, 1932

Between

THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY, THE OREGON STATE BOARD OF HORTICULTURE, OREGON STATE BOARD OF FORESTRY, AND THE OREGON STATE COLLEGE

Cooperative Work in Controlling White Pine Blister Rust in Oregon.

- - - - -

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry and the Oregon State Board of Horticulture, Oregon State Board of Forestry and the Oregon State College effective July 1, 1929 to continue in effect until June 30, 1930, shall be continued in full force and effect in all its provisions for the fiscal year ending June 30, 1933 with the exception of paragraphs E-1 and E-6 which shall be amended to read as follows:

E-1. That this memorandum of understanding shall take effect July 1, 1932 and continue in effect until June 30, 1933, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

E-6. That for the fiscal year July 1, 1932 to June 30, 1933 the Oregon State Board of Horticulture will expend about $[illegible]; the Oregon State Board of Forestry will expend about $1,000.00; the Oregon State College will expend about $1,750.00; and the Federal Government in behalf

of the United States Department of Agriculture, Bureau of Plant Industry about $2,500.00, in connection with the work herein provided for.

$2,500.00	Chas. A. Cole Director, Bureau of Plant Industry, State Department of Agriculture (succeeding State Board of Horticulture)
$1,000.00	Lynn F. Cronemiller State Forester, Oregon State Board of Forestry.
$1,750.00	H. P. Barss Plant Pathologist, Oregon State College.
Jan. 6, 1932	Wm. A. Taylor Chief, Bureau of Plant Industry, U. S. D. A.

BLISTER RUST CONTROL ACTIVITIES IN OREGON

By

L. N. Goodding

Associate Pathologist

No organized operations were conducted in Oregon during 1932. Brief discussion of the following topics is in order; first, scouting for blister rust; second, the Rhododendron Ribes garden; third, cooperation; and fourth, educational work.

SCOUTING FOR BLISTER RUST

Some scouting was done early in the season to locate pine infections. The first of these was in the Marshfield region where the Coos Bay Lumber Company planted Pinus strobus about 25 years ago. The planting is near the post office of Sumner about four miles southeast of Marshfield. The pines are closely associated with Ribes bracteosum and as blister rust had been found much farther south than this it seemed to be a likely place to find it established on the pine. Nothing was found. Pine on the Louts Place on Three Rivers, above Kenn, though growing near Ribes heavily infected in 1930 and 1931, was free from rust. The sugar pine on the Metolius River associated with infected R. petiolare in 1930 and 1931 failed to show infection. It was confidently expected that blister rust would be found on pine on Lost Creek on the McKenzie Highway as rust was abundant on R. bracteosum at that point in 1931, apparently indicating a near-by source of infection. Again the search was futile.

No attempt was made to establish inspection points. There are some general regions which, because of climatic conditions, association of pines and Ribes, or geographical association with existing infection centers, were examined as far as time would permit this season and should be watched carefully in the future. A description of each region follows:

First. The Metolius represents a region ranging in humidity between the typical sugar pine and yellow pine types. Very light infection was found there in 1930 and 1931 on R. petiolare in excellent association with sugar pine. This region will probably offer our first opportunity to study infection on sugar pine under natural conditions. Climatic conditions are probably more favorable here for spread and intensification of the rust than will be found in most sugar pine regions with the possible exception of the upper Rogue River.

Second. Another region representing the transition from more typical western white pine sites to the more arid sites is the region at the headwaters of the Deschutes where the stream flows toward the south. Here are vast quantities of R. petiolare associated with an occasional western white pine seedling. This seems to represent a region where wind currents are likely to bring blister rust spores at an early date.

Third. While the lakes at the summit of the Cascades generally do not represent the best association of the very susceptible species of Ribes with pines, the drainages to the west often do. Waldo Lake drains to the west into the North Fork of the Willamette and into Black Creek. Odell Lake drains to the east but the headwaters of Salt Creek rise very near the lake. This drains to the west. Heavy timber in this region may retard the progress of the rust. These drainages should be carefully watched. Crescent Lake represents a drier site and one less favorable to rust invasion than the west slope but the headwaters of the Middle Fork of the Willamette represent a natural avenue for the spread of the rust. The fact that it has been found on R. bracteosum below Oak Ridge adds to the significance of this region.

Fourth. The headwaters of the Umpqua have been very inadequately scouted. Some extensive burns add to the likelihood of the rust becoming established at an early date if, indeed, it is not already in the region.

Fifth. The headwaters of the Rogue is to be the blister rust battle ground in Oregon in the immediate future. If anything in the line of control is ever done this should be the center of operations. In Muir and Sherwood Creeks, and perhaps other streams as well, there is an abundance of R. bracteosum in association with young western white pines. If this region is not watched it will be because we are remiss in our work.

Sixth. Crater Lake National Park offers a variety of conditions in associations of Ribes and pines; different species of pines; species of Ribes, the susceptibility of which little is known; and marked differences in humidity. There are no true stream type Ribes present but such trailing bushes as R. erythrocarpum and R. binominatum grow in intimate association with the pines. White bark, western white and sugar pine are all present.

Seventh. Blister rust can be expected any season along the coast north of Marshfield where luxuriant patches of R. bracteosum can be found in exposed situations. Pines, however, are found only at a considerable distance back from the coast and along the high ridges where Ribes are either absent or sparse. At Sumner near Marshfield, however, there is a planting of P. strobus in excellent association with R. bracteosum. This has been inspected repeatedly in the past but it must not be neglected in the future. There are many favorable sites for infection on Ribes along the coast south of Marshfield. Infections found on these Ribes along the coast can be taken as an index of the spread of the rust.

Eighth. Elk Creek, along the Crescent City-Grants Pass Highway rises in California and flows across the line into Oregon. In many places along this stream occur large patches of R. bracteosum. Some of these are in excellent association with sugar pine. This region is so situated that blister rust could readily be expected to show up here on its passage

Third. While the lakes at the summit [illegible] do not represent the best association of the very [illegible] of ribes with pines, the drainages to the east [illegible] to the west into the [illegible] of the Willamette and [illegible] Odell Lake drains to the east but the headwaters of [illegible] near the lake. This drains to the west. Every thicket in this region may retard the progress of [illegible]. These streams should be carefully watched. Crescent Lake represents a drier site and one [illegible] most invasion than the west slope but the headwaters of the [illegible] of the Willamette represent a natural avenue for the spread [illegible]. The fact that it has been found on R. [illegible] in [illegible] of this region.

Fourth. The headwaters of the Deschutes have been very [illegible] scouted. Some extensive burns and so the likelihood of [illegible] established at an early date is, indeed, it is not [illegible] in the region.

Fifth. The headwaters of the [illegible] is [illegible] the [illegible] battle ground in Oregon in the immediate future. If [illegible] in the line of control is ever done this should be one [illegible] and sheltered areas, and portions [illegible] dance of R. [illegible] in association with [illegible] white pines. If this region is not watched it will [illegible] we are [illegible] in [illegible].

[illegible] in associations of ribes and pines; different species of pines; species of ribes, the susceptibility of which little is known; and [illegible] in humidity. There are no true stream type ribes [illegible] ing bushes as R. [illegible] and R. [illegible] association with the pines. White pine, western white and sugar [illegible] present.

[illegible] north of Marshfield where luxuriant patches of R. [illegible] in exposed situations. Pines, however, are found only at a [illegible] distance back from the coast and along [illegible] either absent or sparse. At Coquille and Marshfield, however, plantings of R. [illegible] has been inspected repeatedly in the past but [illegible] the future. There are many favorable sites [illegible] the coast south of Marshfield. Infections found on [illegible] coast can be taken as an index of the spread of the [illegible].

[illegible] rises in California and flows across the line into Oregon. In many places along this stream occur large patches of R. [illegible]. Some of these are in excellent association with sugar pine. This portion is so [illegible] that blister rust could readily be [illegible] on the [illegible]

to the south.

The above-described locations should represent excellent indices of the advance of the rust toward California. To make its appearance in California without striking one or more of these locations seems extremely unlikely and assuming that blister rust is to enter California by natural spread it would seem logical to maintain a careful watch in these locations before doing extensive scouting in California.

The following table gives the data for the noteworthy infections located in 1932.

RECORD OF [illegible] BLISTER RUST INFECTIONS ON RIBES IN OREGON, 1932

Location Willamette Meridian	Species Examined	Number of Bushes Exam.	Number of Bushes Inf.	Pine Association	Remarks	Inspectors	Date
Below Oakridge, Ore., S. 16, T. 21 S., R. 3 E.	R. bract.	5	3	None	Rather light.	Goodding	Aug. 5
Elk Creek, McKenzie Highway, Ore., S. 30, T. 16 S., R. 4 E.	R. bract.	10	2	Poor	Rather light.	Goodding	Aug. 3
Lost Creek, McKenzie Highway, Ore., S. 11, T. 16 S., R. 6 E.	R. bract.	25	15	Excellent	General	Goodding	Aug. 8
Couts Place, Three Rivers, Ore., S. 36, T. 8 S., R. 9 E.	R. bract.	10	2	Excellent	Light.	Goodding	Aug. 22
2 mi. east of Midway, Ore., S. 20, T. [illegible] S., R. 8 E.	R. bract.	25	2	None	Very light.	Root and Goodding	Aug. 22
Near Wren, Ore., S. 21, T. 11 S., R. 6 W.	R. sang.	7	7	None	Light.	T. T. Vincent	Sept. 26
Game Farm near Corvallis, Ore., S. 7, T. 11 S., R. 4 W.	R. sang.	1	7	None	Light	Stephen Coleman	Sept.
O.S.C. Farm near Corvallis, Ore., S. 3, T. 11 S., R. 4 W.	R. pet. R. glut. R. sang.	10 6 9	4 2 2	None	Light.	Goodding	Oct. 2
7 mi. north of Marshfield, Ore., S. 36, T. 24 S., R. 13 W.	R. bract.	3	10	None	Medium heavy.	Goodding	Oct. 10
5 mi. above Waldport on Alsea River, Ore., S. 26, T. 13 S., R. 11 W.	R. bract.	10	5	None	Medium heavy.	Goodding	Oct. 11
10 mi. above Waldport on Alsea River, Ore., S. 4, T. 14 S., R. 9 W.	R. bract.	10	5	None	Medium heavy.	Goodding	Oct. 11

[illegible] RIBES GARDEN

The establishment of this garden was reported in the 1930 Annual Report, and a discussion of conditions there was given in the 1931 report. During this season four new Ribes species have been added. Late in April thirty Norwegian Red Dutch currant plants sent to Corvallis by Dr. Hahn of the Division of Forest Pathology were planted in the garden and in October a half dozen of each of the following were planted: R. montigenum, R. roezli and R. lasianthum all from California. The Norwegian Red Dutch currant is a horticultural variety of R. vulgare.

The Norwegian Red Dutch was inspected several times during the early summer and no infection was found. Later it was badly eaten back by rabbits or deer. The other Ribes were not molested. The following report on susceptibility was made by the Division of Forest Pathology at Portland, Oregon, November 18, 1932:

"Extremely Heavy Infection

- R. velutinum
- R. klamathense (2 varieties)
- R. cruentum
- R. marshallii
- R. binominatum

Heavy Infection

- R. hallii
- R. nevadense
- R. erythrocarpum
- R. sanguineum

"No Infection

Norwegian Red Dutch (Ribes vulgare var.)

"You will note that all species except the Norwegian Red Dutch fall into two groups, viz., extremely heavy infection and heavy infection. All species produced abundant telia except R. velutinum. The results of only one year's test on this species, however, cannot be considered a true index of its teliospore-producing capacity.

"All species were given two heavy inoculations, the first on May 13 and the other on May 19. The second inoculation was made because no rain followed the first one."

COOPERATION

Early in the spring Mr. Kimmel of the Forest Service suggested that money might be raised for control operations in the Nebo planted area to protect P. strobus. Owing to the unsettled conditions of blister rust plans at that time nothing was done. It is possible control work might have been done there and at Government Camp if normal conditions had prevailed, Mr. Buck having intimated on previous occasions that the protection of the Government Camp area was desirable. Mr. Collins, who

The establishment [illegible]

Annual Report, and a [illegible]
report. During this season [illegible]
in April [illegible]
Dr. [illegible]
in October a half dozen [illegible]
[illegible]
[illegible]

The Norwegian Red [illegible]
early summer and no infection [illegible]
by rabbits or deer. The other [illegible]
report on susceptibility [illegible]
[illegible]

[illegible]

[illegible]

"You will note that all species [illegible]
into two groups, [illegible]
all species produced [illegible]
results of only [illegible]
be considered a [illegible]

"All species were given [illegible]
[illegible]
[illegible]

[illegible]

Early in the spring [illegible]
that money might be raised for [illegible]
area to protect [illegible]
rust plans at that time [illegible]
might have been done [illegible]
had prevailed, [illegible]
[illegible]

owns much of the private land in this region, had stated his willingness to pay for his portion at such time as the Forest Service was ready to have the work done. While it is true that the Forest Service doubts the desirability of extensive control operations on locale where beetles are likely to take the half grown or mature crop of western white pine, it is hardly fair to the Forest Service to conclude that its members are uninterested in control work or unwilling to contribute funds for certain projects such as those at Hebo, Government Camp and Breitenbush. It is similarly unfair to assume that the Forest Service holds this attitude toward the sugar pine stands in southern Oregon. There are rather extensive stands of sugar pine in Jackson and Josephine Counties on both Forest Service and private lands, the protection of which is quite as urgent as the protection of sugar pine land in California. In fact proximity to the disease renders their early protection much more urgent.

EDUCATIONAL WORK

On January 26, 1932, L. N. Goodding delivered a paper before the Northwest Section of the Society of American Foresters in Portland, Oregon on "The Blister Rust Situation in Oregon". The substance of this paper was obtained from the 1931 Annual Report.

A circular letter to fire wardens, Forest Service field men and others was prepared and approved by the Washington office. Owing to lack of stenographic assistance and Goodding's absence at a time when this should have been sent out, it was never mailed.

One feature article written by Mr. John Burtner of the Oregon State College News Service appeared in the Sunday Oregonian for July 10, 1932. This was based on conditions in the Mount Hood region.

BLISTER RUST CONTROL WORK IN CALIFORNIA
1932

Blister rust control activities in California were continued as a cooperative project between the Bureau of Plant Industry and the California Department of Agriculture, the California State Board of Forestry, College of Agriculture, University of California, and the Department of Botany, University of California. There is given below the amendment to the basic memorandum of understanding, which was drawn up to cover the cooperative work for the fiscal year 1933 beginning July 1, 1932:

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING
Effective July 1, 1931
Between
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY,
THE CALIFORNIA DEPARTMENT OF AGRICULTURE, THE CALIFORNIA STATE BOARD OF FORESTRY,
THE COLLEGE OF AGRICULTURE AND THE DEPARTMENT OF BOTANY, UNIVERSITY OF CALIFORNIA

Cooperative Work in Controlling White Pine Blister Rust in California.

* * *

The undersigned mutually agree that the memorandum of understanding between the United States Department of Agriculture, Bureau of Plant Industry, the California Department of Agriculture, the California State Board of Forestry, the College of Agriculture and the Department of Botany, University of California effective July 1, 1931, to continue in effect until June 30, 1932, shall be continued in full force and effect in all its provisions for the fiscal year ending June 30, 1933 with the exception of paragraphs F-1 and F-6, which shall be amended to read as follows:

F-1. That this memorandum of understanding shall take effect July 1, 1932 and continue in effect until June 30, 1933, provided that either party may terminate the agreement at any time by a written statement to that effect 30 days in advance of the date of termination desired.

F-6. That for the fiscal year July 1, 1932 to June 30, 1933 the California Department of Agriculture will contribute in value approximately $9,000, the California State Board of Forestry approximately $3,000, the College of Agriculture, University of California approximately $10,000, the Department of Botany, University of California approximately

BLISTER RUST CONTROL WORK IN CALIFORNIA
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Exhibit A

MEMORANDUM OF UNDERSTANDING

Effective July 1, 1931

Between

THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY, THE CALIFORNIA DEPARTMENT OF AGRICULTURE, THE CALIFORNIA STATE BOARD OF FORESTRY, THE COLLEGE OF AGRICULTURE AND THE DEPARTMENT OF BOTANY, UNIVERSITY OF CALIFORNIA

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F-6. That for the fiscal year July 1, 1932 to June 30, 1933 the California Department of Agriculture will contribute in value approximately $7,000, the California State Board of Forestry approximately $3,000, the College of Agriculture, University of California approximately $10,000, the Department of Botany, University of California approximately

$3,000 and the Federal Government in behalf of the United States Department of Agriculture, Bureau of Plant Industry, approximately $22,000.00 in connection with the work herein provided for.

Dec. 21, 1932	Dudley Moulton Director, California Department of Agriculture.
Dec. 21, 1932	M. B. Pratt State Forester, California State Board of Forestry.
Dec. 15, 1932	C. B. Hutchison Dean, College of Agriculture, University of California.
Dec. 20, 1932	W. A. Setchell Department of Botany, University of California.
Dec. 29, 1932	Wm. A. Taylor Chief, Bureau of Plant Industry, U. S. D. A.

SCOUTING, EDUCATIONAL WORK AND NURSERY SANITATION IN CALIFORNIA

By

George A. Root

Associate Pathologist

INTRODUCTION

Since the inception of active work in blister rust control in California dating back to 1924, there naturally has been a careful watch kept for signs of the rust. In the earlier years inspection of nursery stock received considerable attention.

By 1929 the gradual spread of white pine blister rust in Oregon warranted an organized scouting program in the northwestern part of California. Scouting continued into southwestern Oregon where the rust was found in Curry County less than 50 miles from the California line. In 1930 and 1931 scouting was again conducted in this general region as well as across northern California as far east as Shasta City. Up to 1932 the scouting project had been relegated to a short period following the termination of other field projects. It was felt, in the light of the spread of the disease in Idaho and Oregon, that a concerted scouting program of longer duration should be inaugurated for California and should include a large portion of the Sierra Nevada region.

Prior to the work in California some scouting was done in central and southern Oregon. It was thought that the rust might be found further south in this state than previously known but such was not the case.

Scouting work in California began in late July and continued with little interruption until the first part of October.

LOCATION OF WORK

Coast Region

It has generally been conceded that the rust would make its entry into California by way of the coast. With this in mind the first scouting work was done in Del Norte and Humboldt Counties. Both harbor the very susceptible species, *Ribes bracteosum*, in great abundance and in some instances in association with 5-needled pines. On the higher ridges, particularly of Del Norte County, both sugar and western white pine grow in considerable numbers but with a scarcity of Ribes present. Along the Smith River and some of its tributaries, 5-needled pines reach a comparatively low elevation. The drainage of this river affords a very likely place for the rust to gain a foothold.

Scouting on the coast was conducted as far south as Eureka. Particular attention was paid to *R. bracteosum* but some of the other

[illegible]
[illegible]

By

George A. Root
[illegible]

INTRODUCTION

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By 1929 the gradual spread of white pine blister rust in Oregon warranted an organized scouting program in the northwestern part of California. Scouting continued into southwestern Oregon where the rust was found in Curry County less than 30 miles from the California line. In 1930 and 1931 scouting was again conducted in this general region as well as across northern California as far east as Susanville. Up to 1932 the scouting project had been relegated to a short period following the termination of [illegible]. It was felt, in the light of the spread of the disease in Idaho and Oregon, that a concerted scouting program of longer duration should be inaugurated for California and should include a large portion of the Sierra Nevada region.

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[illegible]

[illegible]

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Scouting on the coast was conducted as far south as Eureka. Particular attention was paid to R. bracteosum but some of the other

species were not overlooked.

Northern California

This region may be roughly designated as comprising Siskiyou, Trinity, Shasta, Modoc and Lassen Counties. The Klamath National Forest occupies a large portion of the western part of this area and is well described by Harris in his reconnaissance report for 1931. This forest lies almost wholly within Siskiyou County, where conditions are favorable as far east as Yreka for the rust to gain entry.

The Klamath River and particularly its tributaries coming in from the north offer excellent associations of R. *bracteosum* and 5-needled pines. R. *cruentum* is another species which will be a factor in establishing the rust in this region.

One important area is in the vicinity of Mt. Shasta City possessing many factors conducive to harboring the rust. It has a relatively high annual rainfall, is open to sweeping winds from the north, and good pine and Ribes associations are every-where in evidence. One other good point near by is Black Butte, a cinder cone rising more than 1,000 feet above the surrounding country at the end of a vast open plateau. From the base to the top on the north slope there is excellent association of sugar and western white pine with R. *roezli*, R. *nevadense*, R. *hallii* and R. *cereum*. Of particular interest is the presence of Foxtail pine, *Pinus balfouriana* near the summit. The base of Mt. Shasta on the west side not far from Black Butte offers several good inspection points.

Eastern Siskiyou County, particularly that portion east of Yreka and Mt. Shasta is not exceptionally good scouting country. R. *aureum* is first found east of Yreka and there are some good pine and Ribes associations in the range just west of Mt. Hebron. R. *roezli*, R. *inerme* and R. *nevadense* seem to be the predominating species. In spite of these associations and others south of Tennant, the county is so arid as to preclude the sudden invasion of blister rust. The southeastern corner of the county appears to be more favorable for rust development particularly in the vicinity of Bartles, yet here conditions are not very good.

Modoc County offers little in the way of good scouting territory. Comparatively little white pine is present and the country is exceedingly dry. Much of the terrain is of lava formation and what sugar pine there is occupies rocky plateaus. The only 5-needled pines in the northeastern corner of California are in the Warner Range near the summit of Sugar Hill northeast of Davis Creek, but no Ribes are in close proximity to these trees. Some importance can possibly be attached to the inspection of R. *aureum*, which occurs frequently in this county but not in good association with pines.

In Lassen County one does not find satisfactory scouting country until the vicinity of Eagle Lake is reached. R. roezli is the predominating species in this region. The area around Susanville is fairly good territory with considerable R. aureum. That portion of the county in the vicinity of Westwood offers excellent scouting--there is an abundance of streams with numerous Ribes and good pine association.

Eastern Shasta County which takes in the greater part of the Lassen Volcanic National Park warrants careful inspection. R. roezli, R. nevadense and R. inerme are the most abundant species. Near the summit of Mt. Lassen P. albicaulis is found but no Ribes. At lower elevations R. montigenum is found in association with P. monticola. The region around Viola offers good inspection points.

Sierra Region

For the purposes of this report those counties to the south of Shasta and Lassen Counties are designated as the Sierra region.

In eastern Tehama County good scouting conditions exist, particularly in the vicinity of Mineral. Besides sugar pine of all age classes, there are a great number of Ribes in good association with pines. Numerous streams and meadows offer excellent conditions for rust development. Pinyon rust was found in Mineral in 1918 so this point has been more than of passing interest for scouts since that time.

The western half of Plumas County warrants inspections in a scouting program. Much of it is of fairly high elevation, with an abundance of Ribes and pine. Exceptionally good areas to scout are in the vicinity of Lake Almanor and Bucks Lake. The eastern part of the county is quite dry and little attention need be paid to this area.

Sierra and Nevada Counties are quite similar to Plumas County and the western portions of these can be scouted to good advantage. However, particularly good areas are in the vicinity of Sierraville and Hobart Mills, also around the several mountain lakes with particular attention to Donner Lake.

The west side of Lake Tahoe in Placer County has long been considered an area where blister rust might gain a hold. An abundance of Ribes and pines favored by good moisture conditions makes this region one to be scouted at regular intervals. The same is true of this region in Eldorado County. Although somewhat arid, a small area in the eastern part of this county along the Alpine Highway south of Meyers, warrants some inspection.

Inspections in Alpine County were made largely to get an insight

into the pinyon rust. Only in the western part of the county near the summit are there 5-needled pines in association with Ribes.

In reaching Mono County it was necessary to go through a portion of the Carson Valley in Nevada. A planting of R. nigrum was inspected here. At some future time these bushes may show infection which will be unusually interesting and important. Inspections were made in the western part of this county en route to Tuolumne County but no 5-needled pines were noted until the summit was reached at the county boundary line.

Good Ribes and pine associations begin to appear just over the Sierra Nevada on the west side in Tuolumne County. Occasional inspections were made as far west as Pine Crest. Special attention was given Leland Meadows where the pinyon rust has been found for a number of years and which offers an excellent site for blister rust. Other inspections were made not far from Strawberry.

Last inspections of the season for the Sierra region were made in Calaveras County. Of particular interest were those near the Calaveras Grove of Big Trees. Here are ideal conditions for rust development should it once gain entrance. This is attested by the presence of pinyon rust on R. <u>roezli</u> not far from Big Trees. This locality like Mineral and Leland Meadows has harbored this rust before. The interest in these places lies in the fact that all are in excellent sugar pine areas and miles from any known pinyon trees.

Table No. 1 gives a summary of the scouting work in California for 1932:

TABLE NO. 1

TOTAL NUMBER OF RIBES AND PINES INSPECTED

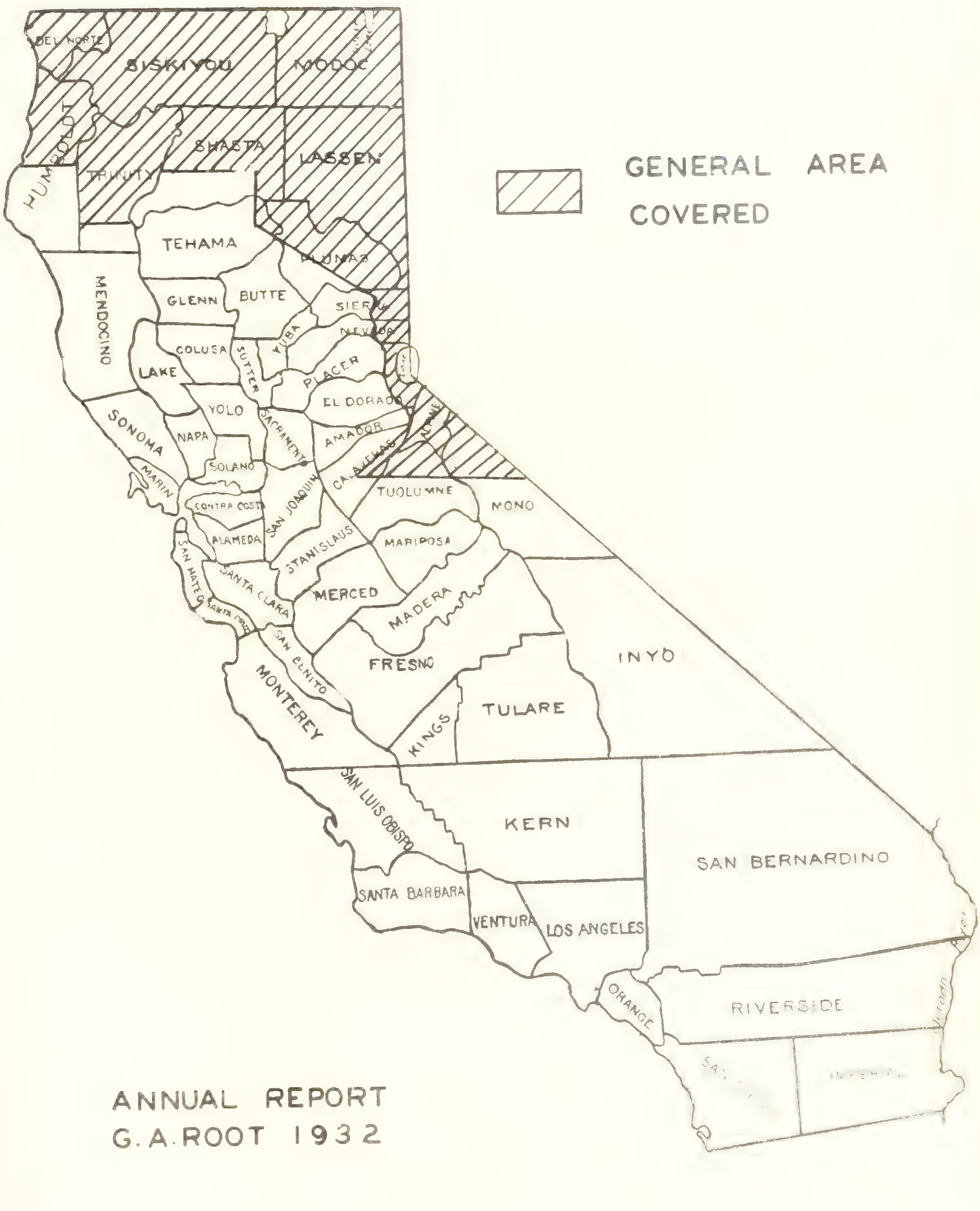
County	Ribes: Number Bushes	Ribes: Number Inspection Points	Ribes: # Number With Good Pine Association	Ribes: Number Infected	Pine: Number Pines	Pine: Number Inspection Points
Del Norte	1,379	24	4	0	1,260	6
Humboldt	1,249	20	5	0	127	2
Siskiyou	3,923	44	25	0	1,416	14
Trinity	249	8	4	0	510	4
Shasta	557	16	5	3	202	4
Modoc	308	11	-	0	75	1
Lassen	[illegible]	15	3	0	162	4
Tehama	673	13	9	0	75	2
Plumas	1,[illegible]53	23	15	## 1	130	2
Nevada	31[illegible]	4	1	## 2	150	2
Sierra	360	16	2	0	1	1
Eldorado	465	9	5	0	40	1
Placer	410	8	2	0	-	-
Alpine	350	11	5	## 2	62	3
Mono	115	6	-	## 2	10	1
Tuolumne	560	7	7	0	305	6
Calaveras	171	6	4	## 2	60	1
Total	14,177*	244	95	12	4,[illegible]97	58

*This total is comprised of 5,[illegible] R. roezlii, [illegible] R. inerme, 2,[illegible] R. bracteosum, 1,371 R. nevadense, 1,003 R. cruentum, 793 R. aureum, [illegible] R. velutinum, 275 R. montigenum, 169 R. divaricatum, 158 R. hallii, 153 R. lasianthum, 123 R. cereum, 118 R. lobbii, 106 R. lacustre, 90 R. laxiflorum, 60 R. sanguineum, 15 R. menziesii, and 1 R. klamathense.

\# Ribes 500 feet or less to pine.

\## Pinyon rust, C. occidentale.

CALIFORNIA SCOUTING MAP 1932



ANNUAL REPORT
G. A. ROOT 1932

DISCUSSION AND RECOMMENDATIONS

The presence of the rust noted in Curry County, Oregon in 1929 and again in 1931 leads one to believe it will be found in Del Norte County, California before very long. This northwestern corner should be continuously scouted but it hardly seems feasible to go further south than Eureka in Humboldt County. Trinity County as a whole can be eliminated until the rust is found to the north in Siskiyou County.

Northern Siskiyou County should receive constant attention especially the Klamath River drainage and tributaries coming in from the north. There is little need to go east of Yreka. As stated elsewhere in this report, careful inspections should be made in the vicinity of Mt. Shasta City--east of here little work need be done. Modoc County can be entirely eliminated as well as the northern half of Lassen County.

If scouting is to be done in the Sierra region, and it seems feasible to continue such each year, eastern Shasta and Tehama Counties should receive first consideration. More extensive scouting is warranted in Oregon, endeavoring to get the southernmost limits before assuming an extensive program for those counties south of Tehama and Plumas Counties.

With the situation as now known, little credence can be placed in scouting in this state prior to August. The later this can be done with favorable weather conditions, the greater the chances for finding the disease. In a known rust area, earlier scouting can profitably be conducted.

EDUCATIONAL WORK IN CALIFORNIA

The educational work in this state has kept pace in a general way with the control program. The subject of blister rust is well known and it now becomes imperative to keep the public informed of progress made and status of the disease relative to this state.

Only two exhibits were made during 1932. On April 16 one was set up at Davis in conjunction with others representing plant pathological problems of the state. The general exhibit was arranged for the annual farmers' picnic which is attended by several thousand people each year.

An educational feature in the way of an automatic balopticon machine was arranged for the state fair in Sacramento and set up in the exhibit of the United States Department of Agriculture. Mechanical troubles developed after two days and further use of it was abandoned. Excessive heat generated by the machine itself coupled with the extremely hot weather caused the difficulty. There is a place for this type of machine in educational work but it has certain limitations.

Several articles were prepared during the year. A short one "The White Pine Blister Rust at the End of 1931" was given the Pacific Rust Press for publication. Another, "Progress of Preparedness for Protecting Sugar Pine Against Blister Rust" was printed in the 1932 February-March issue of the Monthly Bulletin of the California Department of Agriculture. The 1931 December issue, which came out in 1932, contained a summary of the blister rust work for 1931.

On April 7, a talk with lantern slides was given before the botany and plant pathology classes of the College of Agriculture, University of California, at Davis. On April 21, one was given before the County Agricultural Inspectors of Santa Barbara County at Santa Barbara. On April 26 a talk with lantern slides was given before the biology classes of the Polytechnic High School at Long Beach. On May 12, remarks on the status of the rust were made and a map shown before the convention of County Agricultural Commissioners at Yreka near the Oregon-California line.

On August 4, a radio talk "The Present Outlook in the White Pine Blister Rust Field" was given over KGO and its associate network of stations in the Western Farm and Home Hour program. Radio is one of the best agencies through which general information may be disseminated.

Educational sets were given to the state teachers' colleges at Santa Barbara and San Diego. This completes the list of schools of higher education which have received sets. Specimen boxes with literature were sent on request to various high schools and individuals.

SANITATION OF NURSERIES

The last of the pine-growing nurseries of the state was examined regarding blister rust protection by W. V. Benedict in early June. At the request of the Long-Bell Lumber Company an estimate of the cost for the protection of its nursery was determined with other information pertinent to this matter.

This nursery is situated not far from Tennant in Siskiyou County in an area of lava outcroppings in a semi-desert region. Benedict says: "The only 5-needled pines in the whole region (W.P.) grow about 5 miles east air line, on the upper slopes of Garner Mountain. . . . . There are a few sugar pine seedlings produced in the nursery and if the appearance of the present crop is any indication of the quality of the site for sugar pine production, I rather doubt if a blister rust control allotment need be set up for the nursery. This is of course entirely aside the point".

Several articles were prepared during the year. A short one "The White Pine Blister Rust at the End of 1931" was given the [illegible] Press for publication. Another, "Progress of [illegible] for [illegible] [illegible] Blister Rust" was published in the [illegible] [illegible] [illegible] [illegible] contained a summary of the blister rust work for 1931.

On April 7, a talk with lantern slides was given before the botany and plant pathology classes of the College of Agriculture, University of California, at Davis. On April 21, one was given before the County Agricultural [illegible] [illegible] [illegible] remarks on the status of the rust were made with a map [illegible] [illegible] [illegible] California Pine.

On August 4, a radio talk [illegible] [illegible] [illegible] best agencies through which general information may be disseminated.

[illegible] talks were given [illegible] [illegible] individuals.

[illegible]

The last of the pine-growing nurseries of the state was examined regarding blister rust protection [illegible] pertinent to this matter.

This nursery [illegible] entirely aside the point.

The United States Forest Service nursery at Susanville in Lassen County was again examined in 1932. The bed of sugar pine present in 1930 has been removed and no 5-needled pines are now growing there. The propagation of this species has been abandoned for the present.

RIBES ECOLOGY, CALIFORNIA

By
Frank A. Patty
Assistant Pathologist

INTRODUCTION

The Ribes ecology work was confined to checking some of the established plots in the Strawberry area of the Stanislaus National Forest. Only one check was made and that was during the latter part of May and early June.

The following studies were continued during the 1932 season:

- A. Ribes survey of the logging damage and mill plot studies.
- B. Ribes reestablishment in sugar pine-fir and sugar pine-ponderosa pine types after logging.
- C. Ribes reestablishment in stream type after logging.
- D. Ribes seed germination and seedling survival.
- E. Ribes seed germination and seedling survival on dry slopes.
- F. Ribes seed storage in the duff and soil.
- G. Miscellaneous studies.

All of the studies with the exception of A have been described on pages 247-267 of the 1931 Annual Report so only the results to date will be given for each one. An account of A appears in the 1929 annual report, pages 267-270; however, some additional points pertaining to this study will be given.

A. Ribes Survey of the Logging Damage and Mill Plot Studies.

Purpose: To study the influence of different cutting practices upon Ribes establishment and ascertain if there is any feasible regulation of the cut that will inhibit the production of new Ribes plants. Also to acquire additional information on the amount of yearly germination and the length of time Ribes seed continue to germinate after a cutting.

Plot description and treatment. This study is being conducted on the three logging damage and mill plots located in the Stanislaus National Forest in Section 28, T. 4 N., R. 18 E. which were established by the Forest Service on a timber sale area in 1929. There are three 15-acre plots and each was logged during 1929 according to the following marking and cutting practice.

Plot No. 1. Marked, cut and logged in accordance with standard Forest Service timber sale practice of the Region. This method involves cutting all mature timber but leaving at least 3 well distributed ponderosa pine or sugar pine trees per acre. All of the residual stand is protected as much as possible.

Plot No. 2. Marked, cut and logged according to a heavy cutting system which removed merchantable trees of all species to a low diameter limit, (common commercial practice). Much of the residual stand is destroyed.

Plot No. 3. Marked, cut and logged in accordance with the practice recommended in an economic selective logging plan, leaving all fir and cedar and all pines below a D.B.H. of [illegible] inches. Much of the residual stand escapes damage by logging.

The three plots are located within an area from which Ribes were eradicated in 1926 and again in 1929 prior to any logging. The exact number of Ribes per acre removed by the 1926 eradication is not known. For the block in which the three plots are located there was an average of [illegible] Ribes per acre. Four five-acre plots ten chains away showed 20, 32, 56 and 42 Ribes per acre or an average for the twenty acres of 37.5 Ribes per acre before the timber was cut.

Ribes have also been removed around the outside of the three 15-acre plots for a distance of a mile or more on the north and west sides. A record was made of all the Ribes prior to logging on a 2-chain strip surrounding the plots but the bushes were not removed. In 1932 the Ribes on the plots were checked as well as the ones on the 2-chain strip outside, but in neither case were they destroyed.

Results to date: Table No. 1 gives a summary of the number of Ribes and the feet of live stem per acre found prior to logging in 1929 and three years later in 1932. Table No. 2 gives the same points for the 2-chain strip around the outside. Although no definite conclusions can be drawn from this study for several years, a few points are indicated. All of the cutting systems appear to permit the establishment of a formidable Ribes flora. Three years after logging a large Ribes population is present in spite of the fact that the old Ribes were removed in 1926 and 1929 prior to logging. Stored seed must account for at least part of these new bushes.

TABLE NO. 1

RIBES SURVEY LOGGING DAMAGE AND MILL PLOT STUDIES

Plot Number	1929 Check — Totals for Plot 1929 — Live Stem Per Acre: R. nev.	R. roez.	Total	Bushes Per Acre: R. nev.	R. roez.	Total	1932 Check — Totals for Plot 1932 — Live Stem Per Acre: R. nev.	R. roez.	Total	Bushes Per Acre: R. nev.	R. roez.	Total	Acres in Plot
1	1.1	39.5	40.6	.5	9.4	9.9	.3	46.5	46.8	.3	18.9	19.2	15
2	.5	33.5	34.0	.5	9.1	9.6	2.0	267.1	269.1	2.7	97.5	100.2	15
3	1.1	22.7	23.8	.5	4.0	4.5	8.1	98.1	106.2	8.1	20.1	28.2	15
Total or Average	.9	31.9	32.8	.5	7.5	8.0	3.5	137.2	140.7	3.7	45.5	49.2	45

Ribes plotted and eradicated in 1929. Ribes checked but not eradicated in 1932.

TABLE NO. 2

RIBES SURVEY OF 2-CHAIN STRIP AROUND LOGGING DAMAGE AND MILL PLOT STUDIES

Plot Number	1929 Check — Totals for Plots, 1929 — Live Stem Per Acre: R. nev.	R. roez.	Total	Bushes Per Acre: R. nev.	R. roez.	Total	1932 Check — Totals for Plots, 1932 — Live Stem Per Acre: R. nev.	R. roez.	Total	Bushes Per Acre: R. nev.	R. roez.	Total	Acres
1	.4	96.4	96.8	.1	17.9	18.0	.1	153.7	153.8	.1	32.5	32.6	7.5
2	1.8	82.6	84.4	.8	35.5	36.3	5.9	637.8	643.7	4.0	100.0	104.0	7.5
3	1.9	9.9	11.8	1.0	2.8	3.8	70.0	387.3	457.3	17.5	54.5	72.0	4.0
Total or Average	1.3	72.9	74.2	.6	17.7	18.3	16.9	393.6	410.5	[illegible]	64.3	65.5	19.0

Ribes not eradicated in 1929 or 1932.

B. Ribes Reestablishment in Sugar Pine-Ponderosa Pine and Sugar Pine-Fir Types Following Logging.

This study is fully described on pages 251 and 252 of the 1931 Annual Report. The results to date are shown in Table No. 3. Ribes seed did not commence to germinate to any extent until the second year following logging and in the third year germination has made a material drop, due in part to the elimination of the source of new seeds. No doubt there are still many viable seeds in the soil that will be brought to the surface by minor soil disturbances within the next few years. The feet of live stem found during the last two years represents mostly sprouts from bushes which were improperly eradicated. This study should make an interesting comparison to study A because in B the Ribes have been removed every year since logging while in A they have not.

C. Ribes Reestablishment in Stream Type after Logging.

The description of this study appears on page 254 of the 1931 Annual Report. Table No. 4 gives the results to date. New Ribes bushes started appearing in large numbers the first year following logging, continued at about the same rate the second year and then made a decided drop in the third year. Fruiting bushes have been eliminated from this plot and this may account for the drop in new bushes during the third year. There is apparently a greater storage of seed in stream type than there is in the upland types.

TABLE NO. 3

RIBES REESTABLISHMENT IN SUGAR PINE-PONDEROSA PINE AND SUGAR PINE-FIR TYPES AFTER LOGGING

Time Data Recorded	Sugar Pine-Fir Ribes Not Eradicated Before Logging — Plot No. 1				Sugar Pine-Fir Ribes Eradicated Before Logging — Plot No. 2				Sugar Pine-Ponderosa Pine Ribes Not Eradicated Before Logging — Plot No. 4				Sugar Pine-Ponderosa Pine Ribes Eradicated Before Logging — Plot No. 3			
	No. of Seedlings Per Acre	No. of Old Bushes Per Acre	Feet Live Stem Per Acre	Number Of Fruits Per Acre	No. of Seedlings Per Acre	No. of Old Bushes Per Acre	Feet Live Stem Per Acre	Number Of Fruits Per Acre	No. of Seedlings Per Acre	No. of Old Bushes Per Acre	Feet Live Stem Per Acre	Number Of Fruits Per Acre	No. of Seedlings Per Acre	No. of Old Bushes Per Acre	Feet Live Stem Per Acre	Number Of Fruits Per Acre
Before Logging	0	42	342	126	0	56	814	162	0	32	210	50	0	20	201	34
First Year After Logging	1	15	147	56	1	4	18	10	0	28	218	78	0	4	84	0
Second Year After Logging	264	8	35	3	370	3	3	3	76	4	33	5	62	3	8	0
Third Year After Logging	28*	2	12	2	50*	2	8	6	14*	1	7	0	32*	2	15	0

*Feet of live stem for seedlings not included.

TABLE NO. 4

RIBES REESTABLISHMENT IN STREAM TYPE

Ribes Species	Number of Ribes Per Acre												Feet of Live Stem Per Acre												
	Old Bushes Found In			Germinating in 1929 Found In			Germinating in 1930 Found In			Germinating in 1931 Found In		Germinating in 1932 Found in	Old Bushes Found In			Germinating in 1929 Found In			Germinating in 1930 Found In			Germinating in 1931 Found In		Germinating in 1932 Found In
	'30	'31	'32	'30	'31	'32	'30	'31	'32	'31	'32	'32	'30	'31	'32	'30	'31	'32	'30	'31	'32	'31	'32	'32
R. ross.	14	11	1	7	0	1	220	16	2	321	19	100	212	63	2	23	0	4	46	46	2	64	10	10
R. nev.	6	9	0	6	0	0	365	8	2	284	20	15	44	101	0	7	0	0	70	29	3	57	11	1
R. cer.	1	0	0	0	0	0	7	0	0	0	1	0	2	0	0	0	0	0	1	0	0	0	1	0
Totals	21	20	1	13	0	1	602	24	4	605	40	115	258	164	2	30	0	4	117	75	5	121	22	11

D. Ribes Seed Germination and Seedling Survival.

This study was originally begun to determine the effect of soil disturbances on Ribes seed germination and is so titled on page 260 of the 1931 Annual Report. The data thus far have shown that removing the duff and stirring the soil or stirring of the duff and soil together make the most favorable conditions for Ribes seed germination. Therefore the purpose of this study has been changed to find out the percentage of seedlings that survive from year to year. No change has been made in the set-up of the plots.

The last two columns in Table No. 5 show the survival percentage for the 1931 seedlings and the number of seedlings that were found in the spring of 1932. The seeds that produced the seedlings in 1932 on the 1929 plots have remained dormant in the soil since 1929. There were 170 volunteer Ribes present on the 1929 plots in the fall of 1931, 105 died and 65 were living the following spring, making a survival percentage of 38.2. Only two volunteer Ribes have been found on the 1930 plots and they were still alive in 1932.

TABLE No. 5

RIBES SURVIVAL AND SEED GERMINATION

Year Plots Established	Number of Ribes Found in Fall 1931	Number Ribes Found in Spring 1932	Number of Deaths	Survival Percentage	Number of Seedlings Found in Spring 1932
1929	721	283	438	39.2	333
1930	77	44	33	57.1	806
Totals or Averages	798	327	471	40.9	1,139

E. Ribes Seed Germination and Seedling Survival on Dry Slopes.

A description of the study appears on pages 258-260 of the 1931 Annual Report. Table No. 6 gives a summary of the Ribes conditions on these plots in the fall of 1931 and the spring of 1932. On the irrigated plots conditions for Ribes survival are better than on the dry ones. No volunteer seedlings were found on either one of the plots, indicating that there are no Ribes seed stored where the plots are located.

TABLE NO. 5

RIBES SURVIVAL AND SEEDLING GERMINATION ON [illegible] PLOTS

Year Plots Established and Treatments	No. Ribes Found in Fall 1931	No. Ribes Found in Spring 1932	Number of Deaths	Survival Percentage	No. of Seedlings Found in Spring 1932
1929 Dry	57	7	50	12.3	35
1929 Irrigated	90	57	33	63.3	57
1930 Dry	none	none	none	none	1[illegible]3
1930 Irrigated	40	23	7	82.5	110
Totals or Averages	187	97	90	51.3	352

F. Ribes Seed Storage in the Duff and Soil

The purpose and description of this study is found on page 240 of the 1931 Annual Report. An examination of the samples that were placed in the flats in the fall of 1931 revealed that 9.77 per cent of the samples of the top layer, 22.22 per cent of those of the middle layer and 27.77 per cent of the ones from the bottom layer contained viable Ribes seeds which had germinated and produced seedlings. There was an average of 2.1 seeds per sample for the top, 1.7 for the middle and 3.2 for the bottom layers. These results cannot be taken as final because more Ribes seedlings will probably be found next spring due to the delayed dormancy of some of the seeds.

G. Miscellaneous Studies

1. In the fall of 1930 the tops of 80 R. roezli bushes were cut off, leaving the crown and the roots in the ground, and in another group of 80 bushes both the tops and the crowns were cut off. A check in 1932 showed that 40.6 per cent of the bushes with tops removed were still alive and that 43 per cent of these were bearing fruit. Only one per cent survived when both the tops and crowns were removed and none of these were bearing fruit.

2. Several hundred R. roezli fruits were placed on top of the ground in screened boxes in 1929 to find out how long it would take them to germinate. The seeds of these fruits have been subjected to dessication, excess moisture, frosts and fungi. In 1930, 1931 and 1932 some germination has taken place but there are still a large number remaining that appear to be viable.

3. In the fall of 1930 approximately 2,000 Ribes seeds were scattered evenly over a milacre plot having a heavy duff mantle, to see whether or not they would find their way down to the soil. One year later a section of the duff mantle was removed. The top, middle, and bottom layers of duff were removed separately and divided into halves. One-half of each sample was placed in flats out of doors near Strawberry and the balance of each sample was brought into the laboratory for mechanical separation of the seeds from the duff. A check of the samples in the flats the following spring showed 88 seedlings in the top layer, 55 in the middle and 7 in the bottom layer. There will probably be more germination next year. By mechanical separation 163 seeds were recovered from the top layer, 98 from the middle and 7 from the bottom. There is still a section of the duff with seeds in it, and it would be interesting to collect another sample next year to see how far downward the seeds have traveled.

4. Four rodent proof plots eight feet square were established in 1931 to determine how long it would take a given number of seeds to germinate. They were thoroughly cultivated to a depth of about 18 inches and then each one planted with 2,500 R. roezli seeds. A check in 1932 showed an average of 21 Ribes seedlings per plot. The seeds were collected the same year they were planted; hence the after-ripening process which seems to be necessary for this species might not have taken place.

5. In 1931 several strips approximately 6.5 feet in width and from 20 to 40 chains long were cultivated in the area at Strawberry where Ribes have been removed for several years, to find out if any viable seeds are present in the soil. No seedlings were found when the strips were checked in 1932. When areas are logged Ribes seed germination does not usually begin until the second year following logging and this may account for the absence of Ribes seedlings, or there may be no seed stored where these strips were made.

SUMMARY

1. The Forest Service, economic and heavy cutting methods have all permitted the germination and survival of a large number of Ribes during the last three years.

2. The removal of the Ribes twice before logging (1928 and 1929) did not prevent the reestablishment of a sizeable Ribes flora after logging.

3. In sugar pine-fir and sugar pine-ponderosa pine types Ribes seedlings began to appear the second year after logging but dropped considerably during the third year.

3. In the fall of 1930 approximately 2,000 Ribes seeds were scattered evenly over a milacre plot having a heavy duff mantle, to see whether or not they would find their way down to the soil. One year later a section of the duff mantle was removed. The top, middle, and bottom layers of duff were removed separately and divided into halves. One-half of each sample was placed in flats out of doors near Strawberry and the balance of each sample was brought into the laboratory for mechanical separation of the seeds from the duff. A check of the samples in the flats the following spring showed [illegible] seedlings in the top layer, [illegible] in the middle and 7 in the bottom layer. There will probably be more germination next year. By mechanical separation [illegible] seeds were recovered from the top layer, [illegible] from the middle and 7 from the bottom. There is still a section of the duff with seeds in it, and it would be interesting to collect another sample next year to see how far downward the seeds have traveled.

4. Four rodent proof plots eight feet square were established in 1931 to determine how long it would take a given number of seeds to germinate. They were thoroughly cultivated to a depth of about [illegible] inches and then each one planted with 2,500 R. roezli seeds. A check in 1932 showed an average of 21 Ribes seedlings per plot. The seeds were collected the same year they were planted; hence the after-ripening process which seems to be necessary for this species might not have taken place.

5. In 1931 several strips approximately [illegible] feet in width and from [illegible] to [illegible] feet long were cultivated in the area at Strawberry where Ribes have been removed for several years, to find out if any viable seeds are present in the soil. No seedlings were found when the strips were checked in 1932. [illegible] Ribes seed germination does not usually begin until the second year following logging and this may account for the absence of Ribes seedlings, or there may be no seed stored where these strips were made.

SUMMARY

1. [illegible] permitted the germination and survival of a large number of Ribes during the last three years.

2. [illegible]

3. [illegible] the third year.

4. In stream type the Ribes began to appear the first year after logging, continued at about the same rate the second year but dropped off considerably in the third year.

5. There were 798 Ribes on the controlled plots in the fall of 1931. Only 327 or 40.9 per cent of these were found alive in the spring of 1932.

6. Moisture seems to be the limiting factor of Ribes seedling survival on some of the dry exposures.

7. Viable Ribes seeds are present in the top, midlle and bottom layers of the duff and soil.

8. Ribes seeds will work their way down through the different layers of the duff and soil.

9. Seeds of R. roezli are apparently able to undergo adverse conditions (dessication, excess moisture, frosts and fungi) for at least three years and still remain viable.

4. In stream type the Ribes began to appear the first year after logging, continued at about the same rate the second year but dropped off considerably in the third year.

5. There were 708 Ribes on the controlled plots in the fall of 1951. Only 107 or [illegible] per cent of these were found alive in the spring of 1952.

6. Drought seems to be the limiting factor of Ribes seedling survival on some of the dry exposures.

7. Viable Ribes seeds are present in the top, middle and bottom layers of the duff and soil.

8. Ribes seeds will work their way down through the different layers of the duff and soil.

9. Seeds of R. roezli are apparently able to withstand adverse conditions (desiccation, excess moisture, frost) for at least three years and still remain viable.

CONTROL RECONNAISSANCE IN CALIFORNIA

By
Douglas R. Miller
Junior Forester

INTRODUCTION

The greater portion of the important sugar pine stands of the Stanislaus and Eldorado National Forests had been covered by control reconnaissance previous to 1932. There were several small areas of sugar pine, however, chiefly on the Stanislaus Forest which were omitted during the first working. Information on these pine units was needed to facilitate the work on the general sugar pine survey of California, started this season. Since funds for reconnaissance work were not ample to finance the regular field party it was thought advisable to employ a small mobile crew to extend the reconnaissance survey on the Stanislaus and Eldorado National Forests. In addition to locating sugar pine types, Ribes and other conditions within the stands were recorded to afford a basis for preparing cost estimates to protect the sugar pine from blister rust.

DESCRIPTION

A detailed description of these two forests has already been presented. The one for the Stanislaus was given in the 1927 Annual Report and the one for the Eldorado in the 1930 Annual Report.

The areas worked this season consist in general of outlying sugar pine types bordering on main bodies of sugar pine previously covered by reconnaissance. The following descriptions of the individual units apply only to those sugar pine sections completed in 1932.

1. The Strawberry area on the Stanislaus is composed of sixteen sections lying along the north and west boundaries of the 1926-1927 eradication and the 1926 reconnaissance areas. The sugar pine in this locality is mediocre, the country rough with large outcroppings of rock and much of the area has a ground cover of dense brush. The greater part of the timber here has been cut.

2. The Dorrington unit on the Stanislaus lies along the North Fork of the Stanislaus River and Beaver Creek between two areas that were worked by reconnaissance in 1927. The timber over most of the unit is good. Reproduction of both sugar pine and its associated species is present in large amounts and in many cases form dense thickets. Some brush is present under the timber as well as in the large openings. Fifteen sections make up this unit.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]

2. [illegible]

3. The Mokelumne unit on the Stanislaus is composed of the alternate sections that were left in 1931 and a large body of sugar pine north of this which extends to the northern boundary of the Forest. This area contains fifty-three sections. There is a good road system throughout, making it all accessible. Starting from the south, it is drained by the South and Middle Forks of the Mokelumne River, Forest and Blue Creek and the North Fork of the Mokelumne River, all joining just west of the area to form the Mokelumne River. This unit has very good timber. Reproduction is abundant in the southern portion, thinning out in the northern end; some brush is present throughout.

4. The Lumber Yard unit on the Eldorado National Forest is a small block lying north of the North Fork of the Mokelumne River and is bounded on the west by the forest boundary, on the north by the Amador Highway and on the east by the Bear River. The timber is generally poor and is interspersed with many large brush patches. Large rock slides are also present. This area was not completed, and the unfinished portion extends to the north and west. Scouting indicated that the best timber had not been worked in this district. There were fifteen and one-half sections covered here.

METHODS OF WORK

The mechanical methods used in collecting data and in making type maps were the same as those employed during 1931. Extensive reconnaissance was used only to locate the boundary of sugar pine type in marginal timber.

The compilation of data was handled in the same way as in preceding years. The types used were the same as those described in the reconnaissance report for 1931.

Field work was performed by Roy Blomstrom, F. E. Smith and D. S. Miller, all permanent members of the Division of Blister Rust Control. Compilations of data and map work were done by Roy Blomstrom.

WORK PERFORMED AND RESULTS OBTAINED

The results of reconnaissance performed in 1932 are given in the following tables:

5. [illegible]

6. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

TABLE NO. 1

SECTIONS BURNED IN WHOLE OR IN PART
CALIFORNIA RECONNAISSANCE, 1952

Meridian	T.	R.	Intensive Reconnaissance: Sections by Numbers	Intensive Totals: No.	Intensive Totals: Acres	Extensive Reconnaissance: Sections by Numbers	Extensive Totals: No.	Extensive Totals: Acres
Mt. Diablo	3N	17E	1	1	640			
	3N	18E	6	1	576			
	4N	17E	24, 25	2	960	13, 35	2	960
	4N	18E	5, 8, 9	3	1,300			
	5N	15E	24, 25, 36	3	1,600	35	1	165
	5N	16E	3, 4, 8, 17-20, 27-32	11	6,840	18	1	200
	5N	18E	14, 21-23, 26-28, 32-36	12	6,114	26, 35, 36	3	1,280
	6N	15E	1, 2, 4, 8, 10, 12, 14, 16, 18-20, 22-24, 29-31	17	10,340	4, 5, 27, 28	4	2,240
	6N	16E	4-8, 10, 18, 34	8	5,120			
	7N	15E	5, 13, 21-28, 33-36	14	8,320	5, 33	2	640
	7N	16E	15-23, 25-30, 34	19	11,200	21, 26, 34	3	960
	8N	15E	12-14, 17-21, 23, 24, 26-30, 32-34	18	9,360	13, 24, 26	3	960
	8N	16E	7, 18	2	640			
Totals				111	63,010		19	7,405

TABLE NO. 2

EXTENSIVE RECONNAISSANCE

Type	Acres: Stanislaus Nat. For.	Acres: Eldorado Nat. Forest	Acres: Total
SP-PP	930	58	988
SP-PP-CO	60	-	60
SP-P	861	277	1,138
SP-P-CO	120	-	120
Non-SP	4,344	459	4,803
Non-SP-CO	140	-	140
Brush	-	166	166
Total	6,445	960	7,405

TABLE NO. 3

RIBES ANALYSIS OF AREAS COVERED BY RECONNAISSANCE IN CALIFORNIA

Types	Acres		Ribes Per Acre				
	Number	Percentage of Total	R. roezli	R. nevad.	R. viscos.	R. cereum	All Species
Part A - Mokelumne - Stanislaus							
SP-PP	10,163	29.96	18.69	.11	-	.18	19.00
SP-F	13,412	39.55	34.94	.99	.37	.53	36.83
Non-SP	8,981	26.48	33.13	.06	.01	.12	33.62
Brush	501	1.47	52.49	1.11	-	-	53.60
Stream	864	2.54	42.23	37.29	.07	.18	79.77
Totals or Averages	33,920	100.00	27.09	1.41	.15	.35	29.00
Part B - Strawberry - Stanislaus							
SP-PP	1,604	15.89	47.95	4.99	.29	1.57	54.78
SP-PP-CO	3,563	35.31	94.54	1.87	2.06	.59	99.06
SP-F	1,026	10.16	115.77	.41	8.44	1.54	126.16
SP-F-CO	1,227	12.16	201.92	61.40	6.32	3.49	273.13
Non-SP	948	9.39	63.47	-	4.81	20.06	88.34
Non-SP-CO	1,084	10.74	33.92	.37	-	6.53	40.82
Brush	157	1.56	116.49	40.73	-	-	157.22
Stream	139	1.37	53.23	61.06	.37	3.70	118.36
Stream CO	244	2.42	183.29	187.31	1.35	.48	372.43
Totals or Averages	10,090	100.00	95.26	15.30	2.93	5.69	117.17
Part C - Dorrington - Stanislaus							
SP-PP	2,538	27.95	16.86	.49	-	-	17.35
SP-F	2,979	32.81	32.88	.86	-	-	33.74
Non-SP	3,168	34.89	15.31	.30	-	-	15.61
Brush	64	.70	38.75	-	-	-	38.75
Stream	313	3.65	35.98	45.25	-	-	81.23
Totals or Averages	9,080	100.00	22.36	2.17			24.53
Part D - Total - Stanislaus Forest							
SP-PP	14,304	26.95	21.64	.74	.03	.31	22.72
SP-PP-CO	3,563	6.69	94.54	1.87	2.06	.59	99.06
SP-F	17,417	32.80	39.34	.94	.78	.49	41.55
SP-F-CO	1,227	2.32	201.92	61.40	6.32	3.49	273.13
Non-SP	13,095	24.67	24.15	.11	.34	1.75	26.35
Non-SP-CO	1,084	2.04	33.92	.37	-	6.53	40.82
Brush	722	1.36	41.12	16.37	.18	.71	58.38
Stream	1,336	2.51	69.80	67.64	.29	.31	138.04
Stream CO	244	.46	183.29	187.31	1.35	.48	372.43
Totals or Averages	53,090	100.00	39.34	4.18	.58	.95	45.05

TABLE NO. 3 (CONT'D.)

RIBES ANALYSIS OF AREAS COVERED BY RECONNAISSANCE IN CALIFORNIA

Part E - Lumber Yard - Eldorado

Types	Acres		Ribes Per Acre				
	Number	Percentage of Total	R. roezli	R. nevad.	R. viscos.	R. cereum	All Species
SP-PP	2,289	23.09	50.95	.35	-	-	51.30
SP-PP-CO	131	1.33	100.00	-	-	-	100.00
SP-F	3,325	33.58	85.42	.55	-	.27	86.24
SP-F-CO	35	.30	30.00	-	-	-	30.00
Non-SP	2,990	30.15	35.09	-	.43	.42	35.94
Brush	720	7.27	24.67	-	-	1.35	26.02
Stream	330	3.33	81.76	52.92	-	-	134.68
Totals or Averages	9,930	100.00	57.78	1.51	.12	.34	59.75
Part F - All Areas - Both Forests							
SP-PP	16,523	26.33	25.69	.68	.02	.27	26.66
SP-PP-CO	3,784	6.02	94.72	1.81	1.93	.63	99.10
SP-F	20,943	33.34	47.03	.87	.66	.47	49.03
SP-F-CO	1,262	2.00	197.16	59.70	6.16	3.37	266.40
Non-SP	16,035	25.54	26.18	.09	.37	1.50	28.14
Non-SP-CO	1,084	1.72	33.92	.37	-	6.53	40.82
Brush	1,442	2.29	32.91	8.19	.09	1.04	42.23
Stream	1,564	2.48	71.56	57.18	.25	.18	129.17
Stream CO	244	.39	74.95	26.22	-	-	101.17
Total	63,010	100.00	42.16	3.76	.37	.85	47.14

The last week of the field season was spent in extensively mapping an area of 55,300 acres of mixed timber types on the northern end of the Tahoe and southern end of the Plumas National Forests. This mapping was done in connection with the sugar pine survey of the state in order to locate sugar pine areas not covered by timber cruises or other type maps.

STATEMENT OF COSTS

The cost per acre of intensive reconnaissance (extensive reconnaissance was not figured since its cost is not separable from that of the intensive) was $.035 obtained by dividing the total cost of the work by the number of acres covered intensively. This cost is slightly in excess of the normal for these forests as the field work was performed by the higher salaried permanent personnel. If the cost is based on the regular field assistant rate of $100 per month for two men, with the supervision the same, the cost per acre is $.028.

TABLE NO. 4

COST ANALYSIS

Classification	Cost	Per Cent of Total
Supervision - salary and expense	$ 565.68	25.9
Assistants - " " "	1,174.66	53.9
Total	$ 1,740.34	79.8
Subsistence		
Cost of food	$ 148.92	6.8
Cost of meals at Strawberry	86.40	3.9
Cost of meals at eradication camp	36.64	1.8
Total	$ 271.96	12.5
Transportation of men, supplies and equipment	$ 46.72	2.1
Equipment		
Cost of equipment and depreciation	$ 104.21	4.8
Storage of equipment	16.25	.7
Total	$ 120.46	5.5
Miscellaneous	$ 3.67	.1
Grand total	$ 2,183.15	100.0

Number of meals served in reconnaissance camp - 645.
Cost per meal - $.2398

SUMMARY

On the Stanislaus and Eldorado National Forests a total of 63,010 acres of sugar pine and associated types have been covered by intensive reconnaissance at a cost of three and one-half cents per acre. Extensive reconnaissance added 7,405 acres of types which were mapped to delimit the sugar pine in marginal stands.

Percent of total	Cost	Classification
[illegible]	[illegible]	Operation - salary and expense
[illegible]	[illegible]	Maintenance - " "
[illegible]	[illegible]	Total
		Subsistence
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Cost of meals at Strawberry
[illegible]	[illegible]	Cost of meals at [illegible] camp
[illegible]	[illegible]	Total
		Transportation of men, supplies and equipment
[illegible]	[illegible]	
		Equipment
[illegible]	[illegible]	Cost of equipment and [illegible]
[illegible]	[illegible]	Salvage of equipment
[illegible]	[illegible]	Total
[illegible]	[illegible]	Miscellaneous
[illegible]	[illegible]	Grand total

Number of meals served in reconnaissance camp - [illegible].
Cost per meal - $.[illegible]

SUMMARY

[illegible]

SUGAR PINE SURVEY OF CALIFORNIA

By
W. V. Benedict
Assistant Forester

INTRODUCTION

Although white pine blister rust has as yet not been found in California, there is every reason to believe it will enter the state within a few years and seriously damage sugar pine stands. The need for a general plan of control was discussed at the 1932 meeting of the Forest Service, Region 5 Investigative Council and it was considered expedient to undertake the formulation of a Ribes eradication policy. Work was started in June, 1932 as a joint undertaking between the U. S. Forest Service and the Division of Blister Rust Control with one member from each organization assigned to the project. Two additional members of the Blister Rust staff assisted later in the season. The assignment should be completed by June 30, 1933.

PURPOSE

The completed policy statement will show in detail the following points:

1. The location (on 1/2" to the mile national forest maps) of all sugar pine type in California, both virgin and cut-over, segregated into sugar pine-ponderosa pine (SP-PP) and sugar pine-fir (SP-F) types.

2. The total volume and acreage of sugar pine in the sugar pine type by timber type and class of ownership.

3. An estimate of sugar pine volume outside the sugar pine type.

4. Recommendations as to the acreage and stand of sugar pine to be protected and the priority of their treatment. The sugar pine producing capacity of the different pine units as expressed by volume will be used as a guide in determining their selection.

5. An estimate of the cost of control for areas selected for treatment based on blister rust reconnaissance and Ribes eradication records.

METHODS OF WORK

The first step in the program is to assemble from all sources (blister rust reconnaissance records, Forest Service timber survey records

and type maps, timber estimates in the files of private timber owners and the land ownership records at forest headquarters and county offices; information regarding the location, volume and ownership of all sugar pine in the state. This is done as follows:

1. All available timber cruises regardless of ownership or national forest boundaries are examined and the volume of sugar pine in each forty (quarter section and section volumes are used where forty estimates are not extant) recorded on 2" to the mile township plats. An interpretation of timber estimates to describe blister rust SP-PP and SP-F types is also made. All forties having twice as much volume in firs (true firs or Douglas fir) as in ponderosa pine, or 50 per cent or more fir volume, are labeled fir type and those having less than that proportion are classified as pine type. These classifications correspond to blister rust types. Original cruises are taken for logged and burned areas, and cutting limits are outlined.

2. When all sugar pine areas are located, an ownership record is prepared showing the holdings of the various owners on 2" to the mile township plats.

The second step in the survey is to construct the sugar pine type map. Each national forest is considered separately. Sugar pine areas outside national forests, in the aggregate not extensive and largely adjoining forest boundaries at lower elevations, are incorporated with adjacent national forests.

Blister rust reconnaissance maps, now available for roughly 50 per cent of the sugar pine type on five national forests, are used intact and supply the basic types for the sugar pine type map. The two blister rust types are sugar pine-ponderosa pine and sugar pine-fir. The pine type consists of the drier south and west slopes on which ponderosa pine occurs as the principal sugar pine associate. The fir type represents the more moist north and east slopes where one or more species of firs predominate. In both types sugar pine constitutes 15 per cent or more of the total volume of the stand.

Timber estimates are largely used to complete the type map. It is therefore necessary to define the minimum limits of a sugar pine type in terms of volume--this to coincide in so far as possible with blister rust types. A volume of 3,000 board feet per acre closely approximates this minimum limit and identifies sugar pine type on the cruise sheets. Distinction between fir and pine associates are made when recording timber estimates. Cut-over areas are typed by means of original cruises and shown in distinctive colors.

and type maps, timber estimates in the files of private timber owners and the land ownership records of forest headquarters and county offices [illegible] information regarding the location, volume and ownership of all sugar pine in the state. This is done as follows:

1. All available timber cruises regardless of ownership or national forest boundaries are examined and the volume of sugar pine in each forty (quarter section and section volumes are used where forty estimates are not available) recorded on 1" to the mile township plats. An interpretation of timber estimates to describe Wieslander type [illegible] and [illegible] types is also made. All forties having twice as much volume in fir (white fir or Douglas fir) as in ponderosa pine, or [illegible] per cent or more fir volume, are labeled fir type and those having less than that proportion are classified as pine type. These classifications correspond to Wieslander type types. Original cruises are [illegible] for lumber and forest areas, and cutting limits are outlined.

2. When all sugar pine areas are located, an ownership record is prepared showing the location of all sugar pine volume on 1" to the mile township plats.

The second step in the survey is to construct the sugar pine type map. Each national forest is considered separately. Sugar pine areas outside national forests, as the aggregate was extensive and largely adjoining forest boundaries at lower elevations, are incorporated with adjacent national forests.

Wieslander type reconnaissance maps, now available for [illegible] most of the sugar pine type on five national forests, are used largely and supply the basic types for the sugar pine type map. The two Wieslander types are sugar pine-ponderosa pine and sugar pine-fir. The pine type consists of the drier south and west slopes on which ponderosa pine occurs as the principal sugar pine associate. The fir type represents the more moist north and east slopes where one or more species of firs predominate. In both types sugar pine constitutes 10 per cent or more of the total volume of the stand.

Timber estimates are largely used to complete the type map. It is therefore necessary to define the minimum limits of a sugar pine type in terms of volume—this to coincide in so far as possible with Wieslander types. A volume of 2,000 board feet per acre closely corresponds to this minimum limit and localizes sugar pine type on the cruise sheets. Distinction between fir and pine associations are made when recording timber estimates. Cut-over areas are typed by means of original cruises and shown in distinctive colors.

Sugar pine areas not covered by blister rust reconnaissance or timber estimates are typed from other miscellaneous type maps. Field examinations are made to fill any remaining gaps.

The third step in the sugar pine survey is to summarize acreage and volume data. Tabulations are made according to ownership and timber types for each township and working circle of the forests. The classes of ownership computed are (1) Federal, (2) large private owners listed separately, and (3) miscellaneous small owners lumped together. Volumes for areas in the sugar pine type not covered by cruises are computed from an average of timber estimates in the same township (separate for each type), or, if these are insufficient, from those in an adjoining township. This same procedure is followed for the non-sugar pine type in which sugar pine occurs (stands containing sugar pine averaging less than 3,000 board feet per acre). The completed summary of a forest shows:

1. The total board foot volume and acreage by SP-PP and SP-F types for each ownership class in each township and working circle with totals for the forest.

2. The acreage of cut-over for the above. For the present, because of the lack of other information, logged areas will be considered as comparable to uncut areas in the same working circle in gauging sugar pine-producing capacity for the site.

3. Volumes by timber types regardless of ownership for townships and working circles shown separately for cruised and uncruised areas. From this the percentages of cruised and uncruised areas can be obtained.

4. The volume for lands having sugar pine in quantities less than 3,000 board feet per acre, classified in this report as non-sugar pine type, for cruised and uncruised areas.

WORK DONE (AS OF JAN. 30, 1933)

1. Practically all timber estimates and ownership status are collected. Sugar pine estimates are available for approximately 80 per cent of the sugar pine type of the state.

2. Type maps are completed for the Eldorado, Stanislaus and Plumas National Forests.

3. Summary statements are completed for the above three forests.

Forests remaining to be worked are the Sierra, Lassen, Sequoia, Tahoe, Klamath, Trinity, Mendocino and Shasta. The last five forests are

of secondary importance in amount of sugar pine and only a representative working circle on each will be summarized in the detail of the more important forests.

The Yosemite, Sequoia and General Grant National Parks also have important sugar pine stands which will be included in the final sugar pine survey, but which, because of the nature of their administration, will be considered independently when preparing a control policy.

Those engaged in conducting the sugar pine survey fully realize the limitations of the data. Prepared as they are from several sources of generally conflicting information which must be harmonized as best possible to meet the requirements of the survey, it is incredible to expect a refined product. Discretion must be exercised in local application.

Because of the nature of the data secured in this survey, it is considered as of little value until completed and summarized. For this reason, no partial figures are included in this report. The results of the survey will be given in a special report to be completed later.

COST OF WORK

The expenditures incurred by the Division of Blister Rust Control in promoting the sugar pine survey to its present status (Jan. 31, 1933) amount to $6,947.66. This includes the salary and expenses of T. T. Harris from May 1, 1932 to January 31, 1933 and the salaries and expenses of D. R. Miller and F. V. Benedict for the time they spent on the project. The expenses incurred by the reconnaissance crew in performing the typing job on the Plumas and Tahoe forests are also included.

of secondary importance in respect of sugar pine and only a representative working circle as such will be considered in the appraisal of the more important forests.

The Sequoia, Sierra and General Grant National Parks also have important sugar pine stands which will be included in the final sugar pine survey, but which, because of the nature of their administration, will be considered independently when preparing a general policy.

Those engaged in conducting the sugar pine survey fully realize the limitations of the data. Gathered as they are from several sources of generally conflicting information which must be evaluated as best possible to meet the requirements of the survey, it is impossible to extract a refined product. Discretion must be exercised in their application.

Because of the nature of the data secured in this survey, it is considered as of little value until completed and summarized. For this reason, no partial figures are included in this report. The results of the survey will be given in a special report to be completed later.

Cost of Work

The expenditure incurred by the division of Silvics, Forest Survey, in conducting the sugar pine survey to the present time (Jan. 31, 1929) amount to $1,547.56. This includes the salary and expenses of T. E. Harris from May 1, 1928 to January 31, 1929 and the salaries and expenses of D. R. Miller and W. V. Benedict for the time they spent on the project. The expenses incurred by the representatives from in performing the trying job on the Plumas and Tahoe forests are also included.

EXPERIMENTAL RIBES ERADICATION
DORRINGTON AREA, STANISLAUS NATIONAL FOREST, CALIFORNIA

By
W. V. Benedict
Assistant Forester

Experimental Ribes eradication in California for 1932 consisted of two operations, (1) a reeradication of Ribes on the Dorrington unit of the Stanislaus National Forest and (2) an initial eradication on a portion of the Dorrington area not previously worked. A complete description of this area is given on page 275, Annual Report for 1928. It is in virgin timber and except for minor alterations resulting from road improvements, has changed but little in the past four years. The objectives of the work were to investigate Ribes conditions and costs of effecting their removal on an uncut area four years after the first working and to expand the experimental area to provide a wider field of investigation.

REERADICATION

Methods of performing the work were essentially those used in the reeradication studies at Strawberry in 1930 (page 199, Annual Report for 1930), except that a recorder was not attached to an eradication crew. Because of the general scarcity of Ribes the recording of special data was done by a regular crew member. One, two and three man crews were used, depending upon Ribes abundance, the smaller units functioning to advantage in locating areas free of Ribes and in eradicating small scattered patches of bushes. The entire original area was reworked except for 9 acres of stream type extending outside the general experimental area and not advantageously located for permanent study. A 10-man camp was operated from June 15 to August 28.

For the area in general Ribes reestablishment was light. In certain sites, however, chiefly along streams and in brush, Ribes were again gaining a strong foothold. Table No. 1 shows the Ribes distribution, both totals and averages per acre, for the several types encountered in the experimental area. The bushes are classified into seedlings, sprouts and missed, according to origin with respect to the initial eradication. The seedling group represents the new plants germinating after the first eradication; the sprouts are those resulting from viable fragments of root and crown not properly removed, and the missed class includes those bushes not found the first time.

TABLE NO. 1

REERADICATION SUMMARY
TOTAL RIBES ERADICATED - SUMMARY BY TYPES

Part A

Type	Acres	Man Days	Seedlings		Sprouts		Missed Bushes		Totals	
			Bushes	F.L.S.	Bushes	F.L.S.	Bushes	F.L.S.	Bushes	F.L.S.
Str.	207	63.2	5,837	5,278	1,456	8,793	741	25,569	8,034	39,640
Br.	52	27.6	2,349	2,010	2,374	16,083	210	4,935	4,933	23,017
SP_F	905	163.2	17,795	5,549	6,801	24,725	2,379	24,164	26,975	54,438
SP_PP*	4,144	184.2	2,806	5,733	3,127	16,999	8,338	175,777	14,271	198,509
DO	3,242	21.0	-	-	-	-	-	-	-	-
Total	8,550	459.2	28,787	18,570	13,758	66,595	11,668	233,435	54,213	318,604

*Formerly SP_YP (yellow pine), now called SP_PP (Ponderosa pine).

REERADICATION SUMMARY
RIBES ERADICATED PER ACRE - SUMMARY BY TYPES

Part B

Type	Acres	Man Days	Seedlings		Sprouts		Missed Bushes		Totals	
			Bushes	F.L.S.	Bushes	F.L.S.	Bushes	F.L.S.	Bushes	F.L.S.
Str.	207	63.2	28.2	25.5	7.0	42.5	3.6	138.0	38.8	206.0
Br.	52	27.6	45.2	38.6	45.7	309.3	4.0	94.7	94.9	442.6
SP_F	905	163.2	19.7	6.1	7.5	27.3	2.6	26.7	29.8	60.1
SP_PP	4,144	184.2	.7	1.4	.8	4.1	2.0	42.4	3.5	47.9
DO	3,242	21.0	-	-	-	-	-	-	-	-
Tot. or Av.	8,550	459.2	3.4	2.2	1.6	7.8	1.4	27.3	6.4	37.3

Table No. 2 shows by percentages of the total the three classes of Ribes eradicated from the different types. Of special significance is the small amount of new Ribes growth in the seedling group produced in four years in the virgin forest. For a logged area, represented by reeradication data secured at Strawberry in 1930, 88 per cent of the bushes eradicated, containing 60 per cent of the live stem, were seedlings.

The average seedling has .6 feet of live stem, the average sprout 4.8 feet and the average missed bush 20.0 feet. In stream type the average bush contains 5.3 feet of live stem, for brush type the average is 4.7 feet, in SP_F type 2.0 feet (numerous current year seedlings along a new roadway lowered this average) and in SP_PP type 13.9 feet. The average bush for the area as a whole contained 5.9 feet of live stem.

TABLE NO. 2

REERADICATION SUMMARY
PERCENTAGES OF RIBES BY CLASSES

	Percentages of Ribes					
	Seedlings		Sprouts		Missed Bushes	
Type	Per Cent Bushes	Per Cent F.L.S.	Per Cent Bushes	Per Cent F.L.S.	Per Cent Bushes	Per Cent F.L.S.
Stream	72.7	12.4	18.1	20.6	9.2	67.0
Brush	47.6	6.7	48.1	69.9	4.3	21.4
SP_F	66.0	10.3	25.2	45.4	8.8	44.4
SP_PP	19.7	2.9	21.9	8.6	58.4	88.5
Av.	53.1	5.8	25.4	20.9	21.5	73.3

In Table No. 3 is shown the percentages of Ribes roezli and R. nevadense occurring in the different types. Outside of stream type R. nevadense is negligible in the locality.

TABLE NO. 3

REERADICATION SUMMARY
PERCENTAGES OF RIBES BY SPECIES

	Percentages of Species			
	Ribes roezli		Ribes nevadense	
Type	Per Cent Bushes	Per Cent F.L.S.	Per Cent Bushes	Per Cent F.L.S.
Stream	51.7	35.8	48.3	64.2
Brush	99.9	99.9	.1	.1
SP_F	98.3	98.9	1.7	1.1
SP_PP	95.6	96.7	4.4	3.3
Average	90.8	89.2	9.2	10.8

Bushes were recorded as fruiting or not fruiting when they were eradicated. Results are shown in Table No. 4. Fruiting in the aggregate is light, being largest, as would normally be expected, in the missed bush group and even here light compared to fruiting in logged types where 24.4 per cent (reeradication at Strawberry, Annual Report of 1930, page 211) of the missed group were producing fruits.

TABLE NO. 4

PERCENTAGES OF BUSHES FRUITING

Type	Percentages of Bushes Fruiting			
	Per Cent of Seedlings	Per Cent of Sprouts	Per Cent of Missed Bu.	Per Cent of Total Bushes
Stream	.09	1.40	4.6	.2
Brush	-	.08	34.3	1.5
SP-F	.04	2.60	17.8	2.3
SP-PP	.30	1.50	6.1	3.2
Average	.06	1.80	10.5	2.8

Costs of the reeradication job, listed by type, are shown in Table No. 5. Costs for each type were computed from total project expenses on the basis of the number of man days of work for each type.

TABLE NO. 5

COST OF REERADICATION

Type	Acres	Man Days	Ribes Eradicated		Costs		Per Cent of Total			Ribes Per Man Day	Acres Per Man Day
			Per Type	Per Acre	Per Type	Per Acre	Cost	Acres	Ribes		
Str.	207	65.2	8,034	38.8	$ 313.46	$1.51	13.8	2.4	14.8	127	3.2
Br.	52	27.5	4,933	94.9	135.85	2.61	6.0	.6	9.2	179	1.9
SP-F	905	163.2	26,975	29.8	803.81	.89	35.5	10.6	49.8	165	5.5
SP-PP	4,144	184.3	14,271	3.5	907.96	.22	40.1	48.5	26.3	77	22.5
BO*	3,242	21.0	-	-	104.16	.03	4.6	37.9	-	-	154.4
Tot. or Av.	8,550	459.2	54,213	6.4	$ 2,264.24	$ .26	100.0	100.0	100.0	118	18.6

*Areas blocked out because they contained less than 25 feet of live stem per acre.

Costs of eradication are largely governed by Ribes abundance although other factors encountered in working an area, such as brush cover, size of bushes, rock outcroppings and topography exert an important influence. Thus costs are lowest in the open sugar pine-ponderosa pine type where Ribes are fewest. Conversely costs are greatest in the brush and stream types where the heaviest Ribes and most difficult working conditions are encountered. These two types, aggregating only 3 per cent of the area, contain 25 per cent of the Ribes and represent 19.8 per cent of the cost.

TABLE NO. 4

[illegible]

Type	Per Cent of [illegible]	Per Cent of [illegible]	Per Cent of [illegible]	Per Cent of Total [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Average	[illegible]	[illegible]	[illegible]	[illegible]

Costs of the reproduction [illegible], listed by type, are shown in Table No. 5. Costs for each type were computed from total project expenses on the basis of the number of man days of work for each type.

TABLE NO. 5

COST OF ERADICATION

Type	Acres	Man Days	Ribes Eradicated Per Day	Ribes Eradicated Per Acre	Costs Per Type	Costs Per Acre	Per Cent of Total [illegible]				Ribes Per Man Day	Acres Per Man Day
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]					[illegible]	[illegible]	[illegible]	[illegible]				[illegible]
Tot. or Av.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100.0	100.0	100.0	[illegible]	[illegible]	[illegible]

*Areas blocked out because they contained less than 10 feet of live ribes per acre.

Costs of eradication are largely governed by ribes abundance although other factors encountered in working an area, such as brush cover, size of bushes, rock outcroppings and topography exert an important influence. Thus costs are lowest in the open sugar pine-ponderosa pine type where ribes are fewest. Conversely costs are greatest in the brush and stream types where the heaviest ribes and most difficult working conditions are encountered. Though the [illegible], comprising only 7 per cent of the area, contain 22 per cent of the ribes and represent 19.4 per cent of the costs.

In order to more fully understand the significance of the reeradication work the results are compared in Table No. 6 with the results obtained in the initial eradication four years earlier.

TABLE NO. 6

COMPARISON OF REERADICATION WITH INITIAL ERADICATION

Type	Acres Covered		Ribes Eradicated Per Acre			Feet of Live Stem Eradicated Per Acre			Costs Per Acre		
	Initial Erad.	Re-erad.	Initial Erad.	Re-erad.	Per Cent of Decrease	Initial Erad.	Re-erad.	Per Cent of Decrease	Initial Erad.	Re-erad.	Per Cent of Decrease
Str.	* 216	207	183.1	38.8	79	2,950	206	93	$5.70	$1.51	73
Br.	87	52	297.9	94.9	68	3,393	443	89	5.64	2.61	54
SP-F	987	905	43.0	29.8	31	597	60	90	1.33	.89	41
SP-FF	6,372	4,144	23.7	3.5	85	268	48	82	.82	.22	73
DO	897	3,242	-	-	-	-	-	-	.03	.03	0
Tot. or Av.	8,559	8,550	31.3	6.4	79	401	37	91	$1.00	$ .26	74

*Stream type acreage in original eradication shown erroneously as 266.7 instead of 216 acres. As the total acreage for the initial eradication is correct this error of 50.7 acres is thrown into the blocked out area.

For the area as a whole costs have fallen 74 per cent and Ribes 79 per cent. In the sugar pine-fir type, where cost and Ribes reductions are lowest, a new highway has been constructed. The ground disturbance along the right-of-way created favorable Ribes seed bed conditions resulting in the establishment of many seedlings. The seedlings were largely of current season germination and contained but little live stem. The presence of these seedlings obscures the real reductions in numbers of Ribes and costs although it is seen that there has been a 90 per cent reduction in the amount of live stem.

Contrast the reduction in costs and Ribes for this uncut area with reeradication results obtained in 1930 for the logged area at Strawberry. Where costs and Ribes for the uncut area fell almost fourfold and fivefold respectively, the reductions in the logged areas were a little over halved. It appears obvious from these studies that permanent Ribes suppression will be much more readily and less expensively obtained in timbered regions. In fact, based on the 1932 reeradication results, Ribes control for the

Dorrington area is now attained and can be maintained by periodic maintenance work in the favorable Ribes sites until some major disturbance, such as logging or fire, alters present forest conditions.

The reeradication work was systematically checked, both by the camp boss as it progressed and by regular checkers after the area was completed. Instead of the 50 feet of live stem standard of efficiency used for initial eradication work, the reeradication job was held to a 25 foot limit. Checking results showed all parts of the area to be within this limit.

In connection with the checking job an experiment was undertaken to determine the accuracy of the checking work, especially with respect to blocking out areas free of Ribes. Regular eradication crews in 4[illegible] man days completely covered 2,485 acres of the sugar pine-ponderosa pine area designated by prechecking as supporting less than 25 feet of live stem per acre and consequently not requiring work. A total of 1,665 Ribes with 23,534 feet of live stem was removed. This is an average of .7 Ribes or 9.5 feet of live stem per acre. The cost of this experiment amounted to $197.33 or $.08 per acre. The cost of the work and Ribes removed are included in the total results of the reeradication job, which, on a prorated man day basis, adds $.0[illegible] per acre to the average reeradication cost. Under ordinary circumstances this cost would not be incurred.

INITIAL ERADICATION

After the reeradication job was completed the remainder of the field season was devoted to initial eradication in an adjoining stand of mature sugar pine under which occurs considerable brush and reproduction. The location of this area is shown on the file map of the Dorrington Ribes eradication unit. Results of the work are shown in Table No. 7.

[illegible] area is not eliminated and can be maintained by periodic maintenance work in the [illegible] lines after until [illegible], such as logging or fire, alters present forest conditions.

The reeradication work was systematically checked, both by the camp boss as it progressed and by regular checkers after the area was completed. Instead of the 50 feet of live stem standard of efficiency used for initial eradication work, the reeradication job was held to a 25 foot limit. Checking results showed all parts of the area to be within this limit.

In connection with the checking job an experiment was undertaken to determine the accuracy of the checking work, especially with respect to blanking out areas free of Ribes. Regular eradication crews in [illegible] man days completely covered [illegible] acres of the [illegible] area designated by [illegible] less than [illegible] feet of live stem per acre and consequently not requiring work. A total of [illegible] ribes with [illegible] feet of live stem was removed. This is an average of [illegible] ribes or [illegible] feet of live stem per acre. The cost of this work amounted to $157.22 or $.02 per acre. The cost of the work and Ribes removed are included in the total results of the reeradication job, which, on a prorated man day basis, adds [illegible] per acre to the average reeradication cost. Under ordinary circumstances this cost would not be incurred.

After the reeradication job was completed the remainder of the field season was devoted to initial eradication in an adjoining stand of [illegible] under which occurs considerable growth and reproduction. The location of this area is shown on the [illegible] map of the [illegible] eradication unit. Results of the work are shown in Table No. 7.

TABLE NO. 7

INITIAL ERADICATION SUMMARY

Type	Acres	Man Days	Ribes Eradicated: R. roez.	R. nevad.	Both	Av. Per Acre	Costs: Per Type	Per Acre	Ribes Per Man Day	Acres Per Man Day
SP-Y	186	72.0	28,404	190	28,594	154.6	$ 354.51	$1.92	397	2.6
SP-PF	616	183.3	33,310	15	33,325	54.2	902.62	1.47	182	3.4
Tot. or Av.	802	255.3	61,714	205	61,919	77.4	$1,257.13	$1.57	243	3.1

Costs of the field operation for both reeradication and initial eradication are itemized and prorated on a man day basis as shown in Table No. 8. The project leader's salary for one month is charged against supervision in addition to the salary and expenses of the camp boss. The equipment depreciation charge is an arbitrary figure proportionate to the equipment charge shown for the original eradication. Transportation expenses include the expenses of operating the government 1-1/2 ton truck plus a mileage depreciation charge based on an estimated truck life of 80,000 miles. Other expense items are actual field expenditures.

Subsistence costs for both jobs are listed in Table No. 9.

TABLE NO. [illegible]

COST OF OPERATION

Item		Cost	Per Cent of Total
Salaries	Supervision	$ 451.59	12.7
	Temporary Men	1,723.10	48.6
Subsistence	Cook's salary	208.00	5.9
	Cost of food	591.32	16.6
	Transportation, food	72.00	2.0
Equipment	Depreciation charge	$ 149.75	4.2
	Transport, equipment	90.00	2.5
Miscellaneous	Supplies	49.20	1.4
	Expenses	13.47	.4
	Twine	43.77	1.2
	Transport, supplies	61.00	1.7
Transportation of men		85.00	2.4
Total		$3,558.01	100.0
Minus meal charge of $36.64 to reconnaissance project		$3,521.37	–

Operation	Man Days	Per Cent of Total	Cost
Eradication	255.3	35.7	$1,257.13
Reeradication	459.2	64.3	2,264.24
Total	714.5	100.0	$3,521.37

TABLE NO. 9

SUBSISTENCE COSTS

Item	Cost	Per Cent of Total
Groceries, staples	$450.32	
Groceries, perishables	51.02	
Fresh meats	89.98	67.9
Cook's wages	208.00	23.9
Transportation of food	72.00	8.2
Total	$871.32	100.0
Number of meals served		3,373
Cost Per Meal		$.258

Note: The full charge for equipment and miscellaneous supplies should normally be borne by the reeradication job. In this case, however, this expense is practically offset by the expense of conducting the checking experiment which is included in reeradication costs. Therefore all expense items are prorated which gives a more accurate cost for the initial eradication job.

PART I

INVESTIGATIVE WORK IN THE CHEMICAL ERADICATION OF RIBES

By
G. H. Van Atta
Agent

A. Results of 1931 Experimental Chemical Treatments in the Stanislaus National Forest.

It was not possible to check the 1931 experiments in this area until late October of 1932. After a brief survey of the work it was decided that only a partial check would be needed to bring to light all the salient points that could be learned at that late date. This decision will perhaps be more readily understood when it is pointed out that the accuracy of a detailed check is conditioned by the degree to which the experimental plants are disturbed between the time of treatment and the time of checking. If checking is performed in the spring following the treatment, disturbance by animals and man is at a minimum. If, however, checking is delayed until fall, as it was in this instance, it becomes impossible to accurately determine the quantity of stem or the number of bushes actually killed by the treatment.

These difficulties, inherent in late checking, do not prevent the observer from obtaining perfectly valid information of a general nature regarding the effect of experimental treatment, although accurate detailed measurements comparable to those ordinarily made in the spring are out of the question.

In accord with the facts set forth above, the results of these experiments are presented below in the form of general observations rather than as numerical data.

Sprays:

L. W. Collins Weed Killer (a commercial preparation) failed to damage R. roezli.

Ammonium thiocyanate when used in an aqueous spray containing not more than 1.25 pounds of chemical per gallon failed to damage R. roezli. Sprays containing 1.76 to 2.10 pounds of ammonium thiocyanate killed some R. roezli stem but failed to kill any of the bushes treated. On the basis of these trials ammonium thiocyanate is quite plainly not to be

[illegible]

[illegible]

By

G. H. Van Atta

Agent

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In accord with the facts set forth above, the results of these experiments are presented below in the form of general observations rather than as numerical data.

RESULTS

1. E. Collins Weed Killer (a commercial preparation) failed to damage *R. roezli*.

Ammonium thiocyanate when used in an aqueous spray containing not more than 1.44 pounds of chemical per gallon failed to damage *R. roezli*. Sprays containing 1.76 to 2.10 pounds of ammonium thiocyanate killed some *R. roezli* stem but failed to kill any of the bushes treated. On the basis of these trials ammonium thiocyanate is quite plainly not to be

considered a practicable herbicide for use as a spray upon this species.

Dusts:

L. W. Collins weed killer was entirely without damaging effect upon R. roezli.

Soil fumigation with gas:

Sulphur dioxide is quite definitely worthless when used as a soil fumigant to kill R. roezli or R. nevadense.

Ethylene oxide killed only three plants out of a total of 80 that were treated with this chemical. The average quantity applied was approximately one ounce by weight per bush.

Injection and tubulation:

It will be recalled that the experiments conducted under this division of the work were not expected to constitute tests of specific methods of eradication, as such, but were designed to explore the general possibilities for eradication of Ribes by any means whatsoever that would involve the application of chemicals directly to the internal parts of the plants. The most promising suggestion for the development of practical methods of eradication that has thus far arisen from this work deals with the application of toxic solutions or solids partly in solution in moderately small quantities directly to thoroughly lacerated crowns and top roots of plants after the aerial parts have been cut away. In practice, the use of such a treatment would probably be limited to the larger plants of the dry land types, which plants are frequently quite costly to eradicate entirely by hand. No assurance is offered that such a method will prove completely satisfactory, but indications are that it has more than a fair chance for success.

B. 1932 Observations on Experiments Started in 1929 at Clarkia, Idaho.

140 one-half acre plots were laid out and treated with experimental sprays at Clarkia, Idaho in 1929. After they were checked in 1930, the plots which had received five and ten per cent chlorate sprays were divided into halves; one of each pair of half plots was then given a second treatment with the same kind of solution as was used in 1929. In 1931 after the half plots were again checked, a repetition of the original chlorate treatment was applied to that group of half plots which was not treated in 1930.

When the Clarkia area was examined this year, the effects that the technical difficulties imposed by the site had upon the results of the

experiments were even more apparent than they had been at any other time since the work was undertaken. The site and the conduct of the experiments are recorded in the 1929, 1930 and 1931 annual reports.

A detailed check was not performed upon the area this year. It was felt that the extremes in plant environmental circumstances encountered on the plots and the changes that have occurred due to spring freshets, the work of beavers and other animals as well as the regrowth of brush, would have combined to render the data thus collected inaccurate and of doubtful value. A general survey of the whole area was made, however, and it served to strongly emphasize the following points:

1. The influence upon the outcome of the experiments which was exerted by the large variation in type of site within the area was so great as to render the effects of many of the variations in the experimental treatments themselves completely unrecognizable.

2. None of the chemical treatments applied at Clarkia were by any means satisfactorily effective upon R. petiolare growing in certain locations which are characterized by the presence of numerous beaver dams, much running water, very heavy brush, and windfalls.

These facts have previously been recognized but their significance in the light of present knowledge warrants further mention at this time even at the risk of needless repetition.

In 1929 it was hoped that the Clarkia experiment would serve to show the relative effectiveness of applying chemicals in early, mid, and late season. The variations in site mentioned above entirely frustrated this purpose. Some of the reasons for this statement can be shown by briefly discussing certain features of the experiments. The plots treated during June lay mostly at the lower end of the area, those treated in July at about the middle of the area, while the August applications were made on plots that lay far up a side branch of the creek at the extreme upper end of the area. Large local variation within each of these blocks does exist; nevertheless, if each block be considered as a unit, it is possible to recognize three types of site each so different from the others that even if efficiency of crew methods and season of application had been the same throughout, large differences in response to treatment might reasonably be expected to appear between the three blocks. Present knowledge indicates that the magnitude and direction of these differences in results would tend to duplicate those actually observed on the plots. The exact magnitudes of these influences are, however, not known and it is consequently impossible to use the Clarkia experiments as a basis for conclusions upon the relation the season of application bears on the results of chemical treatment.

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1. The influence upon the outcome of the experiments which was exerted by the large variation in type of site within the area was so great as to render the effects of many of the variations in the experimental treatments themselves completely unrecognizable.

2. None of the chemical treatments applied at standard rate in the same were satisfactorily effective upon R. <u>petiolare</u> growing in certain localities which are characterized by the presence of abundant moisture, such running water, very heavy brush, and windfalls.

These facts have previously been recognized but their significance in the light of present knowledge warrants further mention at this time even at the risk of needless repetition.

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The second point refers particularly to the upper block of plots mentioned above and is probably of even greater importance than the first.

The startlingly uniform failure to completely eradicate or, on the basis of the 1932 observations, to apparently even seriously damage R. petiolare plants growing on the upper block of plots cannot be attributed to inexpert treatment, since a number of the plots were carefully sprayed twice (in different years) with the most promising chemical solutions. These plots were treated late in each of the seasons, but this fact could at the most account for only a small part of the failure, since single treatments with the same chemicals applied equally late elsewhere have been much more effective. Other factors than those now recognized may bear a share of the responsibility for the failure, but it seems certain that the major portion of the blame for the lack of success must be attributed to the type of site represented here.

The plots in the upper block lie along the stream in a narrow canyon. They are covered for the most part with dense high brush and are on swampy ground much of which is under standing or running water throughout the summer. Numerous beaver dams and occasional windfalls are largely responsible for keeping the land continually flooded. These same general conditions also obtain in lesser degree on some of the lower plots, but they are by no means as widespread or as severe there as they are upon the upper block. Definite plans have not yet been laid, but when the area was examined this year it was quite apparent that a radically different mode of attack than any thus far employed must be adopted if chemicals are to be successfully used for the eradication of R. petiolare growing upon similar sites.

C. Results of 1931 Experimental Chemical Treatments in Washington.

Table No. 1 is a summary of the experimental chemical applications made last year on the plot basis in the Wenatchee and Snoqualmie National Forests.

Six methods of treatment were employed in performing the experiments reviewed in the table. The kinds of treatment tried were: (1) spray, (2) surface drench, (3) spray and surface drench, (4) subsurface drench, (5) crown drench and (6) injection.

With the exception of those trials in which the chemicals were applied by injection into the bodies of the plants, the crown drenches and those in which ethylene oxide was used, none of the experiments reported in the table involved selective treatment to individual Ribes plants or to Ribes plants only. Great care was taken to treat each plot uniformly over

The second point refers particularly to the upper block of plots mentioned above and is probably of even greater importance than the first.

The startlingly uniform failure to completely eradicate it, on the basis of the 1951 observations, or apparently even seriously damage R. setulosa plants growing on the upper block of plots cannot be attributed to inexpert treatment, since a number of the plots were carefully sprayed twice (in different years) with the most promising chemical solutions. These plots were treated late in each of the seasons, but this fact could at the most account for only a small part of the failure, since single treatments with the same chemicals applied equally late elsewhere have been much more effective. Other factors than those now recognized may bear a share of the responsibility for the failure, but it seems certain that the major portion of the blame for the lack of success must be attributed to the type of site represented here.

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C. Results of 1951 Experimental Chemical Treatments in Washington.

Table No. 1 is a summary of the experimental chemical eradication made last year on the plot basis in the Snoqualmie and Wenatchee National Forests.

Six methods of treatment were employed in performing the experiments reported in the table. The kinds of treatment tried were: (1) spray, (2) surface drench, (3) spray and surface drench, (4) subsurface drench, (5) crown drench and (6) injection.

With the exception of those trials in which the chemicals were applied by injection into the bodies of the plants, the crown drenches and those in which ethylene oxide was used, none of the experiments reported in the table involved selective treatment to individual Ribes plants or to Ribes plants only. Great care was taken to treat each plot uniformly over

its entire area and for this reason with the exception of the experiments noted above, the figures given representing the quantity of chemical used per acre may be considered to accurately represent dosage per unit area.

The work performed in Washington primarily concerned R. *inerme* and except where otherwise specified the remarks that follow will be understood to refer to that species.

As a test of the effectiveness of several chemicals, these experiments seem to rule out further consideration of zinc sulphate and ethylene oxide. Had ethylene oxide been applied evenly to the whole area of the plot rather than selectively to R. *inerme* only, so that the figures for the quantity used would have been comparable to those for the other chemicals, the amount necessary for treatment would have been enormous. The results of the tests also remove copper complex from further consideration as a soil poison for stream type Ribes eradication.

Sodium dichromate yielded fair results in one instance but the quantity of chemical used was relatively larger than that applied in the other experiments and it appears certain that had the same quantity of sodium chlorate or ammonium thiocyanate been used, better results would have been obtained. The salts of heavy metals in general have consistently furnished poor results when they have been used either as sprays or soil poisons against stream type Ribes. They do, however, offer some promise of help in certain other instances which are discussed elsewhere. See paragraphs relating to upland type Ribes in "Recommendations concerning field studies to be undertaken during 1933", Part I, Section D; and paragraphs relating to R. *viscosissimum* and R. *roezli* in "Field recommendations for the chemical suppression of Ribes and barberry", Part III of this report.

The Diesel oil treatments were fairly effective. It should be remembered, however, that the site of these particular treatments was drier than those upon which R. *inerme* generally establishes itself. This fact without doubt contributed much to the degree of success that was attained, trials conducted elsewhere having previously shown that Diesel oil is of little use when applied to R. *inerme* growing upon wet sites. When the original cost, transportation difficulties, and restricted field of applicability of oils are considered, it is readily seen that they cannot hold an important place in stream type eradication.

Ammonium thiocyanate, and sodium chlorate either alone or as Atlacide, were the two most satisfactory chemicals used. The 1932 experiments do not of themselves furnish adequate basis for comparison of the effectiveness of these chemicals. The most that can be said upon this point

TABLE NO. 1

SUMMARY OF RESULTS OF FIELD EXPERIMENTS PERFORMED IN WASHINGTON DURING 1932

Plot Number	Solution Used: Chemical	Solution Used: Per Cent	Solution Used: Pounds Per Gallon	Method of Application	Gallons of Solution Applied Per Acre	Pounds of Chemical Applied Per Acre	Total Gallons of Solution Applied Per Acre	Total Pounds of Chemical Applied Per Acre	Ribes Species Treated	Feet of Ribes Stem Treated	Per Cent of Stem Killed	Number of Ribes Bushes Treated	Per Cent of Bushes Killed	Feet of Ribes Stem Per Acre	Number of Ribes Bushes Per Acre
SWAUK CREEK, WENATCHEE NATIONAL FOREST															
IA 0-.33	Ammonium Thiocyanate	5	.42	Spray	560	252	560	252	R. inerme	6,949	37.0	37	0.0	277,960	1,480
IA .33-.60	do	7½	.63	do	733	462	733	462	R. inerme	2,702	57.0	33	0.0	132,073	1,613
IA .60-.94	do	10	.84	do	582	489	582	489	R. inerme	1,118	90.0	20	0.0	43,400	776
IA .94-1.0	do								R. inerme	1,587	85.0	13	7.7	33,248	272
IIA 0-.57	do	15	1.25	do	630	790	630	790	R. petiolare	97	94.0	4	0.0	2,032	84
IIC (E.66-.90 (W.71-.90	do	5	.42	Surface Drench	1,839	775	1,839	775	R. inerme	5,179	51.5	26	19.6	325,034	1,632
XIIB .25-.49	do	5	.42	Subsurface Drench	3,300	1,388	3,300	1,388	R. inerme	7,524	34.0	40	12.5	413,820	2,200
XIV 0-.40	do	5	.42	do	2,955	1,660	2,955	1,660	R. petiolare	1,087	68.0	68	20.6	35,871	2,244
XIIB 0-.25	do	5	.42	do	6,050	2,540	6,050	2,540	R. inerme	6,762	84.0	61	64.0	357,034	3,221
	do	5	.42	Spray	658	276			R. inerme	2,328	75.0	31	3.3	102,432	1,364
IIB 0-.30	do	5	.42	Surface Drench	1,322	555	1,980	831	R. petiolare	150	33.0	5	0.0	6,600	220
									R. inerme	306	50.0	8	12.5	10,915	285
IIA .57-.94	Atlacide	10	.84	Spray	530	450	530	450	R. petiolare	322	96.2	5	80.0	11,486	178
$XIIB_1$ .32-.66	do	10	.84	Spray	213	179									
	do	10	.84	Surface Drench	2,205	1,853	2,418	2,032	R. inerme	1,007	67.0	17	35.0	71,678	1,210
	do	10	.84	Spray	620	521			R. inerme	1,871	54.0	37	10.8	80,715	1,596
XIIIB 0-.32	do	10	.84	Surface Drench	2,473	2,075	3,093	2,596	R. petiolare	190	100.0	2	100.0	8,197	86
	do	10	.84	Spray	635	543									
VA .33-.64	do	10	.84	Surface Drench	2,540	2,134	3,175	2,677	R. inerme	3,851	65.0	80	12.5	163,976	3,406
	do	10	.84	Spray	600	504									
IIC 0-.33	Copper Complex	5	.42	Surface Drench	1,604	674	2,204	1,178	R. inerme	5,020	56.0	55	1.8	200,800	2,200
	Atlacide	10	.84	Spray	658	557									
IIB .30-.60	Sodium Chlorate	5	.42	Surface Drench	1,322	555	1,980	1,112	R. inerme	4,728	66.0	38	2.6	208,032	1,672
IIIA .32-.66	Copper Complex	5	.42	Surface Drench	2,461	1,035	2,461	1,035	R. inerme	4,521	16.4	34	0.0	186,491	1,403
VA 0-.33	do	10	.84	do	2,395	2,010	2,395	2,010	R. inerme	5,839	34.0	51	25.5	233,560	2,040
									R. inerme	1,189	23.3	30	10.0	26,598	671
XIIIA 0-.59	do	5	.42	Subsurface Drench	4,790	2,010	4,790	2,010	R. petiolare	613	58.2	36	19.4	13,713	805
XIIIA .59-.75	Copper Complex	5	.42	Subsurface Drench	10,650	4,480	10,650	4,480	R. inerme	2,312	44.0	35	8.6	190,740	2,888
VIIAB 0 -1.0	Copper Complex-Glycerine Paste			Injection			3.4		R. lacustre	685	88.0	42	28.6	4,521	277
VIA 0 -1.0	Copper Complex-Glycerine Paste			do			6.8		R. lacustre	680	96.0	40	37.5	8,976	528
IVA .54-1.0	Diesel Oil	100		Surface Drench	1,574		1,574		R. inerme	6,248	88.0	114	55.5	179,318	3,272
	do	100		Spray	547										
IVA 0-.54 *	do	100		Surface Drench	1,287		1,834		R. inerme	6,231	97.0	120	56.0	152,286	2,933
XX	Ethylene Oxide	15	1.25	Subsurface Drench	754	944	754	944	R. inerme	1,595	23.6	22	18.2	150,377	2,074
$XIIIB_2$ .32-.66	Sodium Chlorate	5	.42	do	4,690	1,970	4,690	1,970	R. inerme	1,426	24.7	20	5.0	121,795	1,708
IIC (E.33-.54	Sodium Dichromate	10	.84	Spray	509	426									
(W.33-.61	do	10	.84	Surface Drench	1,530	1,288	2,039	1,714	R. inerme	4,778	94.5	33	21.2	270,291	1,867
IIC (E.54-.66	do	15	1.25	Spray	843	2,785									
(W.61-.71	do	15	1.25	Surface Drench	1,055	3,475	3,628	4,530	R. inerme	2,982	98.5	21	62.0	311,500	2,194
XIIIA .75-1.0	Zinc Sulphate	5	.42	Subsurface Drench	7,895	3,315	7,895	3,315	R. inerme	N. R.	0.0	N. R.	0.0	N. R.	N.R.
STEVENS PASS, SNOQUALMIE NATIONAL FOREST															
I 0-.50	Copper Complex-Glycerine Paste			Injection			13.1		R. bracteosum	N. R.	75.0	N. R.	5.0	N. R.	N.R.
	Ammonium	5	.42	Spray	378	159									
II 0-.70	Thiocyanate	5	.42	Crown Drench	755	317	1,133	476	R. bracteosum	N. R.	12.0	N. R.	3.0	N. R.	N.R.
	do	10	.84	Spray	441	371									
II .70-1.0	do	5	.42	Crown Drench	882	370	1,323	741	R. bracteosum	N. R.	7.0	N. R.	0.0	N. R.	N.R.

*Two-thirds of area in plot treated. Figures given for quantities per unit area calculated on basis of area actually treated.
N.R. No record.

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is that ammonium thiocyanate is less effective than sodium chlorate when used as an aqueous spray of low concentration applied to the aerial parts of the plants. The results obtained with ammonium thiocyanate applied as a subsurface drench were somewhat encouraging, but the experiments were far from adequate to test the two chemicals in this manner of application.

Comparison of the action of several chemicals was only one of the aims of the work performed in 1931. The experiments must also be regarded as preliminary steps in the investigation of the relative merits of the several methods of application previously enumerated as well as attempts to establish dosage limits that could be used as guides for future work.

The reason that the conclusions drawn from the 1931 work must for the most part be somewhat indefinite and general in nature is to be found in the large number of variables involved in the program by reason of the facts mentioned in the foregoing paragraph. The following example is given as an illustration of the requirements that multiple variables impose upon an experimental program. In order to test and compare the action of only two chemicals upon H. _inerme_ when used according to three methods and in three dosages, it would be necessary to perform at least 18 fair sized experiments upon each type of site. If the number of methods to be tested is four instead of three, at least 24 experiments would be necessary instead of 18. If these requirements are only partially met, the results of the trials will of necessity be inconclusive.

Acquisition of reasonably definite knowledge concerning the minimum dosage of any widely applicable chemical necessary to the perfect eradication of H. _inerme_ growing on one type of site would be equivalent to the establishment of a standard of reference which would very materially simplify and assist future experimental programs. While the 1931 work did not furnish such a standard it at least brought out the fact that for the eradication of H. _inerme_ growing upon the particular type of site concerned in these experiments, the minimum dosage of either ammonium thiocyanate or sodium chlorate is greater than 2,000 pounds per acre. Subsequent to the 1931 field season and before checking the experiments in 1932, an indirect method of calculation was devised by which the minimum dosage of sodium chlorate required for perfect eradication of H. _inerme_ was calculated to be approximately 3,500 pounds per acre upon the basis of complete coverage. It is hardly necessary to point out that this figure is not meant to represent the quantity of chemical that must be used per acre in ordinary eradication but rather that it is an estimate of the quantity needed to treat an acre of ground completely covered with H. _inerme_. The data upon which the calculation was based included those taken from all the experiments recorded up to that date in which sodium chlorate was applied to H. _inerme_

is that ammonium thiocyanate is less effective than sodium chlorate when used as an aqueous spray of low concentration applied to the aerial parts of the plants. The results obtained with ammonium thiocyanate applied as a subsurface drench were somewhat encouraging, but the experiments were far from adequate to test the two chemicals in this manner of application.

Comparison of the action of several chemicals was only one of the aims of the work performed in 1931. The experiments must also be regarded as preliminary steps in the investigation of the relative merits of the several methods of application previously enumerated as well as attempts to establish dosage limits that could be used as guides for future work.

The reason that the conclusions drawn from the 1931 work must for the most part be somewhat indefinite and general in nature is to be found in the large number of variables involved in the program by reason of the facts mentioned in the foregoing paragraph. The following example is given as an illustration of the requirements that multiple variables impose upon an experimental program. In order to test and compare the action of only two chemicals upon E. inerme when used according to three methods and in three dosages, it would be necessary to perform at least 18 only ... experiments upon each type of site. If the number of methods to be tested is four instead of three, at least 24 experiments would be necessary instead of 18. If these requirements are only partially met, the results of the trials will of necessity be inconclusive.

Acquisition of reasonably definite knowledge concerning the minimum dosage of any widely applicable chemical necessary to the perfect eradication of E. inerme growing on one type of site would be equivalent to the establishment of a standard of reference which would very materially simplify and assist future experimental programs. While the 1931 work did not furnish such a standard it at least brought out the fact that for the eradication of E. inerme growing upon the particular type of site concerned in these experiments, the minimum dosage of either ammonium thiocyanate or sodium chlorate is greater than 1,000 pounds per acre. Subsequent to the 1931 field season and before checking the experiments in 1932, an indirect method of calculation was devised by which the minimum dosage of sodium chlorate required for perfect eradication of E. inerme was calculated to be approximately 3,500 pounds per acre upon the basis of complete coverage. It is hardly necessary to point out that this figure is not meant to represent the quantity of chemical that must be used per acre in ordinary eradication but rather that it is an estimate of the quantity needed to treat an acre of ground completely covered with E. inerme. The data upon which the calculation was based included those taken from all the experiments recorded up to that date in which sodium chlorate was applied to E. inerme

as well as some special information collected during the 1931 field season. At best, the estimate is only a very rough approximation and it now appears that the figure given may be too low.

The injection method was the only type of treatment employed that proved itself to be definitely unsuitable for stream type or thicket Ribes eradication. There are many reasons why this method cannot be used to advantage in such work, but the following one is considered sufficient to illustrate the point. Unless far greater time is spent upon each thicket than would be necessary to accomplish complete Ribes eradication by hand, it is physically impossible to treat all or even nearly all of the individual plants in the thicket and thus the primary reason for using chemicals rather than hand labor alone is defeated.

Subsurface and surface drenches as well as combinations of sprays and drenches seem to have some merits but require more rigid test. Crown drenching is merely a modification of the surface drench method and is not new to this work.

The results of the 1931 program do not permit going beyond these general conclusions regarding methods of treatment for the same reasons that were mentioned in the discussion of chemicals.

The few trials of ammonium thiocyanate applied to *R. petiolare* would seem to indicate that this chemical is inferior to sodium chlorate as an herbicide upon that species, but final judgment should be withheld until the results of more extensive trials are available.

The figures in Table No. 1 illustrate the apparent lack of relationship between the stem kill and the bush kill achieved by chemical treatment. This fact has often before been remarked, but seldom have the experimental figures so well illustrated the point. On plot IA .00-.94, 90 per cent of the *R. inerme* stem existing at the time of treatment was killed although not a single bush died from the effects of the chemical. At the time the plot was checked in the spring of 1932, if one were to judge only by the high percentage of stem killed, it would have been easy to conclude that the treatment had been fairly successful. By midsummer, however, such profuse regeneration had taken place that hardly any evidence of the damage done by the chemical was apparent to casual observation. A very different state of affairs than that mentioned above existed on plot XII B 0-.25. Here, 84 per cent of the stem and 84 per cent of the bushes were killed. By the middle of summer the appearance of the plot had not changed appreciably since the spring check. Soil drenching seems to afford a slightly better correlation between stem and bush kill than does spraying, but the point is unproved and of doubtful significance at the present time. Clearly it is extremely unsafe to base conclusions concerning effectiveness of treatment upon figures representing stem kill only.

as well as some special information collected during the 1951 field season. At best, the estimate is only a very rough approximation and it now appears that the figure given may be too low.

The injection method was the only type of treatment employed that proved itself to be definitely unsuitable for [illegible] eradication. There are many reasons why this method cannot be used to advantage in such work, but the following one is considered sufficient to illustrate the point. Unless far greater time is spent upon each colony than would be necessary in accomplishing complete [illegible] eradication by hand, it is practically impossible to treat all or even nearly all of the individual plants in the colony and thus the primary reason for using chemicals rather than hand labor alone is defeated.

Subsurface and surface drenches as well as combinations of spray and drenches seem to have some merits but require more study. Trench drenching is merely a modification of the surface drench method and is not new to this work.

The results of the 1951 progress do not permit going beyond these general conclusions regarding methods of treatment for the same reasons that were mentioned in the discussion of chemicals.

The few trials of ammonium thiocyanate applied to *H. petiolaris* would seem to indicate that this chemical is inferior to sodium chlorate as an herbicide upon that species, but final judgment should be withheld until the results of more extensive trials are available.

The figures in Table No. 1 illustrate the apparent lack of relationship between the stem kill and the root kill achieved by chemical treatment. This fact has often before been remarked, but seldom have the experimental figures so well illustrated the point. On plot IA.50-51, 75 per cent of the H. [illegible] stems existing at the time of treatment had killed although not a single root died from the effects of the chemicals. At the time the plot was checked in the spring of 1952, if one were to judge only by the high percentage of stem killed, it would have been easy to conclude that the treatment had been fairly successful. By midsummer, however, such profuse regeneration had taken place that hardly any evidence of the damage done by the chemical was apparent on casual inspection. A very different state of affairs than that mentioned above existed on plot XII B 07-51. Here, 96 per cent of the stems and 98 per cent of the stands were killed. By the middle of summer the appearance of the plot had not changed appreciably since the spring check. Soil drenching seems to effect a slightly better correlation between stem and root kill than does spraying, but the point is unproved and of doubtful significance at the present time. Clearly it is extremely unsafe to base conclusions concerning effectiveness of treatment upon figures representing stem kill only.

It is not always practical to present all of the data necessary to the correct evaluation of experimental results in concise form. In the absence of extremely lengthy reports, it is believed that the type of general discussion that is offered here and which is intended to take into account the multitude of factors known to be involved in the problem affords a better picture of the status of the work than a study of the numerical data alone can give.

D. Results of Laboratory and Greenhouse Work, May, 1932.

An important share of the greenhouse and laboratory program that followed the 1931 field season was devoted to a study of the possibilities and importance of soil treatment in chemical eradication. A brief summary of this part of the work follows.

The toxicities to Ribes of several chemicals were compared in a series of experiments in which the substances to be tested were added in measured quantities to culture solutions in which plants were growing. Under the conditions of the trials, sodium arsenite was found to be at least 30 times as toxic to Ribes as sodium chlorate and at least 15 times as toxic as ammonium thiocyanate. When the same chemicals were applied as soil treatments to potted Ribes plants somewhat different results were obtained. At least two times as much sodium chlorate as sodium arsenite was needed to kill the plants. Ammonium thiocyanate was somewhat less effective than sodium chlorate. *Berberis vulgaris* plants were killed with the application of only about three-quarters of the quantities of sodium chlorate and ammonium thiocyanate necessary to accomplish the same effect upon Ribes.

The differences in the results of the two types of experiments do not impeach the accuracy of either set of findings, but instead furnish a rough measure of the extent to which the chemicals concerned are altered by contact with the soil. The results of the culture solution tests should perhaps best be regarded as representing the relative toxicities of the chemicals while those of the soil experiments are to be more properly considered as expressing the relative effectiveness of the same chemicals under conditions comparable to those found in practice.

By using the results of these tests and by assuming the existence of certain probable but as yet unproven relationships, rough calculations were made which indicated that it would be necessary to use about 5,000 pounds of sodium chlorate per acre to accomplish the destruction of Ribes by uniform soil treatment.

In another series of experiments, a study was made of the rate at which certain chemicals were either destroyed or removed from the solution in contact with the soil. Samples of forest soil gathered in

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In another series of experiments, a study was made of the rate at which certain chemicals were either destroyed or removed from the solution in contact with the soil. Samples of forest soil [illegible]

northern Idaho were used in the tests which were continued over a period of about five months. Each chemical was tested in samples, the moisture of the contents of which was maintained respectively at 15, 30, and 40 per cent of the weight of the wet soil.

The stabilities of thiocyanate and chlorate ions were found to vary greatly with the moisture contents of the soils. The thiocyanate ion disappeared about twice as rapidly as the chlorate ion from the samples kept at 15 to 30 per cent moisture, but took about ten times as long as the chlorate ion to disappear from the samples containing 40 per cent of water. The chlorate ion disappeared about nine times as rapidly from the samples kept at 40 per cent moisture as from those kept at 15 or 30 per cent. The rate at which the thiocyanate ion disappeared from the soil solutions was about two and three-quarters times as rapid in the samples containing 15 and 30 per cent of water as in those kept at 40 per cent moisture.

Part of the results of these soils experiments and the data taken from the culture solution tests have been utilized in calculating the dosage figures for ammonium thiocyanate and sodium chlorate given below:

Pounds of Chemical Estimated to be Required Per Acre for the Destruction of Ribes by Means of Soil Treatment

Per Cent moisture in Soil	Sodium Chlorate	Ammonium Thiocyanate
15	2,300	4,000
30	2,900	5,300
40	3,540	2,800

It is hardly necessary to point out that all figures derived as these were, from calculations involving many uncontrollable and as yet incompletely studied variables, are susceptible to considerable inaccuracy. Consideration of the known sources of probable error leads to the belief that the estimated dosages are somewhat smaller than will be required in practice.

The greenhouse work also included tests of the effectiveness as herbicides of several chemicals which previously were untried for this purpose. Efforts to stabilize thiocyanate and chlorate in contact with soil were unsuccessful. Heavy metal ions were found to be very rapidly removed from solution in contact with soil and for this reason cannot be considered as good soil poisons for the broadcast types of application.

The movement of chemicals injected in the body of the plant was studied in the laboratory with the aid of materials gathered during the 1931 field season. Space does not permit a review of the findings of this investi-

gation to date. It will suffice to state that translocation is extremely irregular and that this mechanism can hardly be expected to furnish the basis for a method of Ribes eradication.

The difficulty and uncertainty experienced in obtaining satisfactory field plants for greenhouse culture and experimentation has made it desirable to develop dependable and convenient methods for propagating Ribes plants from seeds. Work upon this subject was started after the close of the 1931 field season and still continues. Results obtained to date indicate that the desired methods will soon be forthcoming and that consequently the problem of stocking the greenhouse and Ribes garden will be solved satisfactorily.

The foregoing brief sketch of the laboratory and greenhouse program for the year makes no mention of a number of studies that were incidental to the major subjects of investigation. The separate laboratory reports should be consulted for any details here omitted.

<u>E. Field Experiments Conducted in 1932.</u>

The financial outlook prevailing at the start of the field season demanded that efforts be made to confine investigative activities rather sharply to those problems, solutions for which would be most urgently needed in the immediate future. It was decided, therefore, to devote nearly all of the field program to a concentrated effort aimed at the completion of certain phases of the work begun during 1931 in the Wenatchee National Forest. Happily the investigative work had reached a stage at which a narrowed scope of activities was virtually demanded from the technical as well as the practical point of view.

The principal problems that were selected for study in the field were:

1. The comparison and evaluation of sodium chlorate and ammonium thiocyanate as herbicides upon <u>R. inerme</u>.

2. The determination of the relative effectiveness of three methods for applying the two chemicals mentioned above to <u>R. inerme</u>. The three methods to be tested were: (a) application of chemical as an aqueous spray to aerial plant parts; (b) application of chemical in solution beneath the surface of the ground to the soil about the roots of the plants; and (c) application of chemical by a combination of the two foregoing methods.

3. The establishment of the minimum dosage of either sodium chlorate or ammonium thiocyanate necessary to accomplish the eradication of <u>R. inerme</u>.

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The principal problems that were selected for study in the field were:

1. The comparison and evaluation of sodium chlorate and ammonium thiocyanate as herbicides upon R. inerme.

2. The determination of the relative effectiveness of three methods for applying the two chemicals mentioned above to R. inerme. The three methods to be tested were: (a) application of chemicals as an aqueous spray to aerial plant parts, (b) application of chemical in solution between the surface of the ground to the soil about the roots of the plants and (c) application of chemical by a combination of the two foregoing methods.

3. The establishment of the minimum dosage of either sodium chlorate or ammonium thiocyanate necessary to accomplish the eradication of R. inerme.

4. An inquiry designed to discover the main causes underlying the observed fact that Ribes plants of the same species growing upon different sites sometimes respond quite differently to identical treatments.

In addition to the major objectives set forth above, the plan for the field program provided that an inorganic arsenic compound be tested in large dosage as a subsurface soil drench in order to establish if possible an ultimate standard of comparison for this type of substance. It was also planned to test a commercial mixture of chemicals which was being offered as an herbicide under the trade name "Calcium Chloron" if a sufficient supply of the material could be made available during the season.

After the season was under way it was decided to include several tests of a method of applying chemicals in an aqueous solution as a drench upon the foliage and the surface of the soil. Several short experiments were also undertaken in the Clearwater region in Idaho in which arsenic pentoxide (as arsenic acid) and antimony trichloride were applied as pastes and in solution to freshly cut surfaces of R. viscosissimum plants.

With the exception of the last named division and that pertaining to the fourth major objective, all of the experimental work was conducted upon plots adjacent to the 1931 area located on Swauk Creek in the Wenatchee National Forest in Washington. Numerical summaries of the experimental treatments are given in Tables No. 2 and 4.

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After the season was under way it was decided to include several tests of a method of applying chemicals in an aqueous solution as a spray upon the foliage and the surface of the soil. Several small experiments were also undertaken in the Clearwater region in 1941 in which [illegible] and ammonium [illegible] were applied in [illegible] solution to freshly cut surfaces of R. viscosissimum plants.

With the exception of the [illegible] pertaining to the fourth major objective, all of the experimental work was conducted upon plants [illegible] in the 1941 [illegible] National Forest in Washington. Numerical summaries of the experimental treatments are given in Tables No. 2 and 4.

TABLE NO. 2

FIELD EXPERIMENTS CONDUCTED IN WENATCHEE NATIONAL FOREST, WASHINGTON, DURING 1932

Plot Number	Chemical Used	Method of Application	Pounds of Chemical Per Gallon of Solution	Gallons of Solution Used	Pounds of Chemical Used	Area Treated in Acres	Gallons of Solution Used Per Acre	Pounds of Chemical Used Per Acre	Total Gallons of Solution Used Per Acre	Total Pounds of Chemical Used Per Acre	Date of Application
10	Ammonium thiocyanate (1)	Subsurface Drench	0.50	187.50	93.75	.0375	5,000	2,500	5,000	2,000	6-24
11	do	do	0.50	262.50	131.25	.0375	7,000	3,500	7,000	3,500	6-25
12	do	do	0.50	375.00	187.50	.0375	10,000	5,000	10,000	5,000	6-27,28
	do	do	0.50	112.50	56.25		3,000	1,500			6-28
13	do	Spray	1.43	26.25	37.50	.0375	700	1,000	3,700	2,500	7-5
	do	Subsurface Drench	0.50	187.50	93.75		5,000	2,500			7-1,5
16	do	Spray	1.43	26.25	37.50	.0375	700	1,000	5,700	3,500	7-5
	do	Subsurface Drench	0.50	262.50	131.25		7,000	3,500			7-1,5
14	do	Spray	2.14	26.25	56.25	.0375	700	1,500	7,700	5,000	7-5
21	do	Spray	2.50	33.80	84.50	.0338	1,000	2,500	1,000	2,500	7-6
20	do	do (2)	1.75	70.50	123.40	.0353	2,000	3,500	2,000	3,500	7-6,7
19	do	do (2)	2.50	75.00	187.50	.0375	2,000	5,000	2,000	5,000	7-6
	Calcium-Chloron (3)	Foliage and Surface Drench	0.50	375.00	187.50		10,000	5,000			
33	Sodium hydroxide (4)	do	0.01+	375.00	5.00	.0375	10,000	133	10,000	5,133	8-11
	Calcium-Chloron (3)	do	1.00	187.50	187.50		5,000	5,000			
35	Sodium hydroxide (4)	do	0.02+	187.50	5.00	.0375	5,000	133	5,000	5,133	8-12
31	Sodium arsenite	Subsurface Drench	0.50	131.25	65.60	.0187	7,000	3,500	7,000	3,500	7-19
18	do	do	0.50	187.50	93.75	.0187	10,000	5,000	10,000	5,000	7-20,21
17	do	do	0.50	451.00	225.50	.0375	12,022	6,011	12,022	6,011	7-13,19
1	Sodium chlorate	do	0.50	169.00	84.50	.0338	5,000	2,500	5,000	2,500	6-23
4	do	do	0.50	231.00	115.30	.0330	7,000	3,500	7,000	3,500	6-22
2	do	do	0.50	358.00	179.20	.0358	10,000	5,000	10,000	5,000	6-22,23
26	do	do (5)	0.32+	1,229.00	395.00	.0282	43,560	14,000	43,560	14,000	7-9,12
	do	Subsurface Drench	0.50	93.30	46.60		3,000	1,500			6-20
3	do	Spray	1.43	21.80	31.10	.0311	700	1,000	3,700	2,500	6-21
	do	Subsurface Drench	0.50	169.00	84.50		5,000	2,500			6-20
6	do	Spray	1.43	23.60	33.80	.0338	700	1,000	5,700	3,500	6-21
	do	Subsurface Drench	0.50	233.60	116.80		7,000	3,500			6-21
5	do	Spray	2.14	22.20	50.00	.0334	664	1,500	7,664	5,000	6-22
7	do	Spray	2.50	33.00	82.50	.0330	1,000	2,500	1,000	2,500	6-17
28	do	do	2.50	37.50	93.75	.0375	1,000	2,500	1,000	2,500	7-9
29	do	do (2)	1.75	75.00	131.25	.0375	2,000	3,500	2,000	3,500	7-8
8	do	Spray	2.65	45.25	120.60	.0301	1,500	4,000	1,500	4,000	6-16,17
9	do	do (2)	2.50	75.00	187.50	.0375	2,000	5,000	2,000	5,000	6-17,18
27	do	do (2)	2.50	75.00	187.50	.0375	2,000	5,000	2,000	5,000	7-8
32	do	Foliage and Surface Drench	0.50	243.00	121.50	.0253	10,000	5,000	10,000	5,000	8-10
34	do	do	0.50	375.00	187.50	.0375	10,000	5,000	10,000	5,000	8-11

(1) A commercial grade of this chemical sold under the trade name "Weedex" containing approximately 80 per cent of ammonium thiocyanate.

(2) Half the total quantity of spray was applied and allowed to dry on the foliage before the remaining half was applied.

(3) A commercial product containing approximately 10 per cent of calcium hypochlorite, $Ca(OCl)_2$.

(4) Sodium hydroxide was added to Calcium-Chloron solution to partially stabilize the hypochlorite and thus avoid rapid destruction of the metal equipment used in mixing and applying the solution.

(5) The quantity of solution applied was equivalent to one gallon per square foot of ground surface treated.

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TABLE NO. [illegible]

LOG OF WEATHER AND PLOT TREATMENTS, [illegible] CREEK, WENATCHEE NATIONAL FOREST, JUNE 17 TO AUGUST 12, 1932

Date	Weather	Plots Treated	Date	Weather	Plots Treated
6/17	Mild, Clear	7 and 8 Spray	7/12	Warm, Clear	35 Drench
18	Cool, Heavy rain	9 Spray	13	Cool, Rain	17 Drench
19	Clear		14	Cool, Rain	
20	Warm, Cloudy	3 and 6 Drench	15	Cool, Heavy rain	
21	Warm, Cloudy	3 and 6 Spray 5 Drench	16	Cloudy	
22	Mild, Cloudy	5 Spray 2 and 4 Drench	17	Cloudy	
23	Warm, Clear	1 Drench	18	Mild, Clear	
24	Warm, Clear	10 Drench	19	Mild, Clear	31 Drench
25	Mild, Clear	11 Drench	20	Warm, Clear	
26	Rain		21	Warm, Clear	18 Drench
27	Warm, Clear	12 Drench	26	Warm, Clear	
28	Warm, Clear	15 Drench	27	Warm, Clear	
7/1	Mild, Cloudy	16 Drench	28	Mild, Clear	
2	Heavy rain	14 Drench	29	Mild, Cloudy	
3	Cool, Rain		30	Mild, Clear	
4	Cold, Cloudy		31	Cloudy	
5	Mild, Clear	13, 14 and 16 Spray	8/1	Mild, Clear	
6	Warm, Clear	19 and 21 Spray	4	Hot, Clear	
7	Warm, Clear	20 Spray	5	Warm, Clear	
8	Warm, Clear	27 and 29 Spray	10	Cool, Rain	32 Drench
9	Warm, Heavy rain	23 Sp., 25 Dr.	11	Mild, Cloudy	33 and 34 Drench
10	Cool, Cloudy	25 Drench	12	Warm, Clear	35 Drench
11	Mild, Cloudy	26 Drench			

Maximum temperatures for 24-hour periods recorded as (1) <u>Cold</u>, less than 55° F., (2) <u>Cool</u>, 55 to 64° F., (3) <u>Mild</u>, 65 to 74° F., (4) <u>Warm</u>, 75 to 84° F., and (5) <u>Hot</u>, 85° F. or more.

The term <u>Clear</u> indicates the total or nearly total absence of clouds for the major portion of the day, and the term <u>Cloudy</u> indicates the reverse. The terms <u>Rain</u> and <u>Heavy rain</u> indicate that moderate or heavy rain fell at some time during the day.

TABLE NO. 4

FIELD EXPERIMENTS CONDUCTED IN IDAHO WITH ARSENIC ACID AND ANTIMONY TRICHLORIDE DURING 1932

Plant No.	Species	Point of Tubulation	Solution Used	Volume of Solution Absorbed in c. c. First Hour	Volume of Solution Absorbed in c. c. First 17 Hours	Time of Application	Date of Application	Location
			Tubulation Tests					
1	R. petiolare	3/8" diameter stem. No side branch	Solution made by dissolving arsenic pentoxide (As_2O_5) in water at the rate of 25 grams per 100 c.c. of solution.	3.5	11.5	3:00 p.m.	8/26	North edge of road one-half mile down stream from 1932 Methods Camp, Orogrande Creek, Idaho.
2	do	1/4" diameter branch 5" from junction with 3/8" diameter stem.		7.3		do	do	
3	do	1/4" diameter stem 2" from junction with 1/4" and 3/8" diameter branches		6.0	22.0	do	do	
4-6	R. viscosissimum						8/27	
			Crown Scarification Tests					
7	R. viscosissimum		Arsenic pentoxide-water paste				8/27	West edge of road between Headquarters and Big Island one-fourth mile north of Meadow Creek, Idaho.
8-15	do		Antimony trichloride-water paste				do	

The experience gained in the previous season demonstrated that many important technical advantages could be gained by applying experimental chemicals uniformly to the area within each plot. Accordingly, that procedure was adopted for the application of all plot treatments undertaken in 1932.

The results of the 1931 field experiments, together with the findings obtained in the conduct of the winter program in the laboratory and greenhouse indicated quite clearly that it would be necessary to apply chemicals in quantities upwards of 2,500 pounds per acre in order to eradicate R. inerme. This opinion was confirmed by a study which was made of the records of all previous field experiments performed upon R. inerme and R. lacustre. It was feared that treatments such as were planned would, when applied over a fairly extensive area, constitute a hazard to roving live stock and that the danger from fire would be excessive unless steps were taken to minimize this risk; moreover, destruction of treated plants by animals and man sometimes seriously detracts from the value of field experiments. It was decided, therefore, to build a stout four strand barbed wire fence around the whole experimental area and to cut fire trails around all the plots that were to receive sodium chlorate sprays. This was done before any of the treatments were begun. A very strong and tight seven strand fence enclosing a small area that was to be used for the arsenic experiments was also erected within the outer fence. Conspicuous warning signs were placed at frequent intervals around the arsenic plots. In all, more than 2,000 feet of fence was built.

The plots were all laid out to the size of two rods by three rods. These dimensions were selected as standards to facilitate certain features of the work and to insure provision for adequate test of such treatment contemplated.

To facilitate handling large volumes of solution, a portable gasoline engine driven pump was employed in making the treatments. The equipment set-up used was very similar to that which has been developed for large scale power spraying.

Great care was taken to apply each treatment evenly to the whole area concerned in order that the cause for any variation that might later appear in the results of any particular test would not lie in irregularities of experimental procedure.

After the plots had been laid out and before the treatments were begun, an accurate map of the plots was drawn showing the brush cover and other features pertinent to the work. In those instances in which flowing water was found to be within the boundaries of a plot, the area covered by the water was determined and deducted from the total area of the plot. The treatments that were subsequently made were applied only to the portions of

the plots that were not submerged, the dosage having been computed upon that basis.

Each plot was divided into narrow lanes with string lines. Cross lines were also laid which divided the length of the lanes into quarters. During the course of each application, the man in charge of the mixing station kept a close account of the rate at which the solution was being delivered and the progress of the treatment on the plot. In this way matters were so adjusted that uniform application of the chemical was achieved.

For applying the subsurface drenches, the spray nozzle was replaced at the end of the extension pipe with a small pointed hollow cap having two holes about one-sixteenth of an inch in diameter drilled through the wall opposite one another about three-eighths of an inch from the tip. The diameter of the cap was only slightly larger than the regular extension pipe. To operate the implement, the point was thrust just under the surface of the ground, the control valve was opened, and pressure was applied to drive the extension pipe into the ground about 20 inches, whereupon, the valve was closed and the tool was withdrawn from the hole. The interval of time during which the valve remained open and the pipe was being pushed into the ground was determined by the volume of solution intended for each hole and the rate of flow. The rate of solution delivery under operating conditions was determined and the time required to apply each dose was computed before the experiments were started. The applications were made in holes that were uniformly spaced nine inches apart over the surface of each plot treated by the method.

The foliage and surface soil drenches were applied by means of a straight nozzle which replaced the extension rod at the end of the hose.

Power application as has been stated was adopted at the first of the season primarily for the saving of time and labor. Experience speedily demonstrated, however, that it offered even more important advantages by reason of its flexibility and the accuracy of treatment control that it permitted.

The attempts that were made to compare the effects of chemicals applied as sprays with those that follow drenching were partially frustrated by reason of the fact that very shortly after the sprays were applied, heavy rains fell which washed nearly all the chemical from the foliage onto the ground. The foregoing statement applies particularly to the sodium chlorate sprays. The first time that rain interfered with this part of the program was on June 18 just after a series of sodium chlorate sprays had been applied to plots number 7, 8 and 9. Later in the season a second and extra series of the same kind of treatments was applied to plots number 27, 28 and 29. The work was finished on the morning of July 3 and in the afternoon heavy rain

the plots that were not submerged, the dosage having been computed upon that basis.

Each plot was divided into narrow lanes with string lines. Cross lines were also laid which divided the length of the lanes into quarters. During the course of each application, the man in charge of the mixing station kept a close account of the rate at which the solution was being delivered and the progress of the treatment on the plot. In this way changes were so adjusted that uniform application of the chemical was secured.

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The foliage and surface soil drenches were applied by means of a straight nozzle which replaced the extension rod at the end of the hose.

Power application as has been stated was adopted at the first of the season primarily for the saving of time and labor. Experience speedily demonstrated, however, that it offered even more important advantages by reason of its flexibility and the accuracy of treatment control that it permitted.

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began and continued to fall for some hours. The spray treatments were in effect, therefore, combinations of sprays and surface drenches and must be so regarded when they are checked in the spring of 1933. A record of the weather that prevailed during the field season together with a log of the plot treatments is given in Table No. 3.

During field season in the Inland Empire it is not unusual for rains to occur which are heavy enough to wash chemicals from sprayed foliage. It has been observed that large quantities of some chemicals, notably the chlorates, can and do usually persist unchanged upon the leaves and stems of sprayed plants until they are removed by water in the form of rain. Recognition of these facts leads to the conclusion that an aqueous spray applied to aerial plant parts must ordinarily be considered to be the rough equivalent of a combination of aerial spray and surface soil drench. Even without further information it is conceivable that contact of the chemical with the subterranean plant parts through the medium of the soil solution may commonly be quite as important in achieving eradication as contact with the stems and leaves. This hypothesis gains weight from the indefiniteness of the results which have followed efforts to prove that Ribes plants may be killed by chemicals translocated downward from the leaves and stems. There is, furthermore, good evidence taken from other sources that this process is not possible to any great extent, at least in the case of chlorates. The relation of these points to the plan of the field program will be at once apparent.

In the foregoing pages the expression "type of site" has been used to convey a meaning which may not be quite clear without further definition. The characteristic groupings of environmental influences that condition the responses to chemical treatment shown by plants of a single Ribes species growing in different locations are regarded as typifying the various kinds of sites with respect to that species. In other words, response to chemical treatment is considered to be a function of environment. Morphological and physiological characters and tendencies are regarded as being acted upon by environmental influences but they need not necessarily be the only factors directly concerned in differentiating plants of a single species from one another with regard to the action of chemicals. Kind of soil, abundance of rain, abundance of soil moisture, and presence of running or standing water are some of the other agents that may be considered as typifying a site. Until the present time, not much work has been done in studying the effect of ecological variation upon results of chemical treatment within what is generally called stream type. More complete information upon the subject is urgently needed in order that methods of eradication may be wisely chosen.

Recognition of the principle set forth above led to the formulation of the fourth objective of the 1932 field program. At the start of the season almost no information was available to serve as a guide in selecting the best

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Recognition of the principle set forth above led to the formulation of the fourth objective of the 1935 field program. At the start of the season almost no information was available to serve as a guide in selecting the best

methods for pursuing the study and it was necessary, therefore, that the first steps be exploratory in nature. The little that was known had to do with the aerial parts of the plants. As a first move an attempt was made to block in the rest of the picture by directing attention to the immediate environment of the Ribes roots and to the roots themselves.

As soon as the plots on Swauk Creek were laid out, a number of holes which reached the surface of the water table were dug at various spots on the area. These holes were kept open and a rough check of the vertical movement of the water table was kept throughout the season with the intent to discover whether or not the height of the water table could be readily correlated with the response of the plants to chemical treatment. Later in the season, work was begun upon the gross morphology and immediate environment of Ribes roots both in the Swauk Creek area and at several points in northern Idaho. _Ribes inerme_ and _R. petiolare_ were the principal species examined. Although the efforts made thus far represent little more than orientation studies, several general conclusions which may later be found significant seem to be apparent. They are:

1. The _R. inerme_ plants that grew upon certain areas to which sodium chlorate sprays were applied with the most success in 1931 were characterized by relatively shallow root systems.

2. Soil aeriation is necessary to the development of healthy _R. inerme_ roots.

3. Ribes petiolare roots can and do grow in aeriated flowing water, but they either decay or fail to develop in the non-aeriated portions of water-logged soils.

4. It was unusual to find _R. inerme_ roots below the surface of the water table as it existed during August of this year.

It is true that the foregoing observations might have been predicted from past experience and a general knowledge of plants; nevertheless, positive knowledge concerning these and other like points is deemed necessary to the establishment of sound basic principles for the chemical eradication of Ribes in the future.

It is hoped that it will be possible to continue this investigation in the future in very close coordination with controlled chemical plot studies.

I. Laboratory and Greenhouse Investigative Program for the period September, 1932 to May, 1933.

The work being conducted at present follows the plan set forth in the "General Outline of Investigations to be Undertaken in the Chemical Eradi-

methods for pursuing the study and it was necessarily inevitable that the first steps be exploratory in nature. The little that was known had to do with the aerial parts of the plants. As a first move an attempt was made to block in the rest of the picture by directing attention to the immediate environment of the Ribes roots and to the roots themselves.

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It is true that the foregoing conclusions might have been predicted from past experience and a general knowledge of plants; nevertheless, definite knowledge concerning these and other like points is deemed necessary to the establishment of a sound basic principle for the chemical eradication of Ribes in the future.

It is hoped that it will be possible to continue this investigation in the future in very close coordination with eradication chemical spray studies.

B. Laboratory and Greenhouse Investigative Program for the Period September, 1934 to Mar. 1935.

The work being conducted at present follows the plan set forth in the "General Outline of Investigations to be Undertaken in the Chemical Eradi-

cation of Ribes and Barberry 1932-1933" which was submitted by Mr. Offord on November 1, 1932. This program is the direct outgrowth of the investigative work completed up to that date. For further details, the reader is referred to the above mentioned outline and the special reports to be submitted as the various studies are completed.

C. Recommendations Concerning Field Studies to be Undertaken During 1933

California

Inland type Ribes: At the present time only one type of treatment is proposed for further trial upon the dry land types of Ribes found in this state. The method of experimentation recommended consists in applying chemicals in moderately small quantities to the thoroughly scarified or mutilated crowns and top roots of decapitated plants. Both oils and water soluble salts should be tested in the experiments. Of the former class of substances, Diesel oil is recommended for test by reason of its general availability, low cost, and the fact that former trials have shown it to be as good if not better for the purpose than other oils that might be considered. Past experience indicates that sodium chlorate, copper sulphate, and sodium fluoride should be submitted to further test. The development of this type of method is only intended to assist in the destruction of those occasional plants the eradication of which by hand is excessively costly.

Inland Empire

Stream type Ribes: Definite recommendations for future work with chemicals and methods of application, dosage, etc., cannot be made until the results of the 1932 field trials become available through the spring check to be performed in 1933. It is believed that the comprehensive tests conducted in the Wenatchee area in 1931 with sodium chlorate and ammonium thiocyanate will furnish conclusive evidence regarding the relative merits of these two chemicals. The check should also make possible the correct evaluation of the methods of application and dosages used so far as that type of site is concerned.

Since the information that checking will reveal regarding these points is considered to be vital to the proper formulation of recommendations for future work, it is hoped that the 1933 check can be made well in advance of the regular field season.

It is suggested that the 1933 field investigations of chemical eradication in stream type include work upon the following subjects:

1. Methods for the destruction of R. inerme based upon the findings of the 1932 work in Washington. This work should test previous conclusions and

cation of Ribes and nursery 1951-1952" which was submitted by Mr. Offord on November 1, 1951. This program is the direct outgrowth of the investigative work completed up to this date. For further details, the reader is referred to the above mentioned outline and the special reports to be submitted as the various studies are completed.

C. Recommendations Concerning Field Studies to be Undertaken During 1952

California

Upland type Ribes: At the present time only one type of treatment is proposed for further trial upon the dry land types of Ribes found in this state. The method of eradication-application recommended consists in applying chemicals in moderately small quantities to the thoroughly exposed or mutilated crowns and top roots of decapitated plants. Both oils and water soluble salts should be tested in the experiments. Of the former class of substances, Diesel oil is recommended for test by reason of its general availability, low cost, and the fact that former trials have shown it to be as good if not better for the purpose than other oils that might be considered. Past experience indicates that sodium chlorate, copper sulphate, and sodium fluoride should be submitted to further test. The development of this type of method is only intended to assist in the destruction of those occasional plants the eradication of which by hand is excessively costly.

Inland Empire

Stream type Ribes: Definite recommendations for future work with chemicals and methods of application, dosages, etc., cannot be made until the results of the 1951 field trials become available through the spring check to be performed in 1952. It is believed that the comprehensive tests conducted in the Nematches area in 1951 with sodium chlorate and ammonium thiocyanate will furnish conclusive evidence regarding the relative merits of these two chemicals. The check should also make possible the correct evaluation of the methods of application and dosages used so far as that type of site is concerned.

Since the information that checking will reveal regarding these points is considered to be vital to the proper formulation of recommendations for future work, it is hoped that the 1951 check can be made well in advance of the regular field season.

It is suggested that the 1952 field investigations of chemical application in stream type Ribes work upon the following projects:

1. Methods for the destruction of R. lacustre based upon the findings of the 1952 work in Washington. This work should test previous concentrations and

should be conducted during June upon the beach and sand bar classes of site.

2. Value of draining inundated Ribes sites prior to the application of chemicals. The trials relating to this subject should be performed upon a site similar to the upper end of the 1929 experimental area at Clarkia, Idaho.

3. Relation of underground plant parts and their environment to response of Ribes to chemical treatment. These studies should be linked very closely with the chemical studies conducted by this project upon the controlled plot basis. They should be designed to discover if possible whether or not a relationship exists between type of site and effectiveness of chemical treatment. If such a relationship does exist, these studies and the results of the chemical experiments should be designed to furnish a definite basis for distinguishing the various types of sites prior to chemical treatment.

Upland type Ribes: The recommendations that are made for this branch of the work are exactly the same as those for the California species and are intended to apply in particular to R. viscosissimum.

[illegible]

4. [illegible]

5. [illegible]

[illegible]

PART II

INVESTIGATIONS IN CHEMICAL METHODS FOR THE ERADICATION OF BARBERRY

By
H. R. Offord, Agent, and George L. Draper, Agent

INTRODUCTION

The cooperative agreement set up in the spring of 1930 between the Division of Barberry Eradication and the Division of Blister Rust Control has been operative during the field season of 1932. In accordance with the terms of this agreement, laboratory experiments have been undertaken at Moscow, Idaho, and field experiments at Maumee, Ohio, and Pennsylvania Furnace, Pennsylvania. The previous results of laboratory and field experiments were used as a basis for the selection, dosage, and manner of application of the following chemicals: sodium chlorate, ammonium thiocyanate, copper complex, and zinc ammonium chloride. A summary of laboratory findings for barberry and the application of those findings to field problems is given in Part III of the annual report for this project. This report, Part II, deals only with the results of field experiments. The program of field work has been under the joint supervision of F. C. Meier, Pathologist-in-Charge, Division of Barberry Eradication, and H. R. Offord, Agent, Division of Blister Rust Control. All of the field work reported herein has been undertaken by George L. Draper, Agent.

A. Recheck of 1930 Experiments at Maumee, Ohio

The 1930 spraying experiments and individual bush treatments performed at Maumee, Ohio, were given a cursory check to note any departure from data taken in 1931. The following observations were made:

Spraying experiments: All plots sprayed with sodium chlorate or Atlacide still showed 100 per cent kill of barberry plants. No sprouting appeared in any of these plots. No change was apparent in the data taken over plots sprayed with pitch oil in 1931. Those bushes which were sprouting at that time were still living. The data taken on the kerosene-sprayed plot likewise remained substantially the same. Due to the slow penetration of oils, it was thought that a second year's check on oil-sprayed plots might show a substantial increase in per cent kill. Such did not prove to be the case; it was noted, however, that on the plot sprayed with the kerosene-phenol solution practically all seedlings of less than 0.5 feet of live stem were dead. The live stem reduction on bushes with more than 0.5 feet of live stem was not significant.

PART II

INVESTIGATIONS OF SPRAYING METHODS FOR THE ERADICATION OF BARBERRY

by

H. R. Offord, Agent, and George E. Fraser, Agent

INTRODUCTION

The cooperative agreement set up in the spring of 1930 between the Division of Barberry Eradication and the Division of Blister Rust Control has been operative during the field season of 1932. In accordance with the terms of this agreement, laboratory experiments have been undertaken at Beacon, Texas, and field experiments at Maumee, Ohio, and Pennsylvania Furnace, Pennsylvania. The previous results of laboratory and field experiments were used as a basis for the selection, dosage, and manner of application of the following chemicals: sodium chlorate, ammonium thiocyanate, copper complex, and zinc ammonium chloride. A summary of laboratory findings for barberry and the application of these findings to field problems is given in Part III of the annual report for this project. This report, Part II, deals only with the results of field experiments. The progress of field work has been under the joint supervision of F. C. Meier, Pathologist-in-Charge, Division of Barberry Eradication, and H. R. Offord, Agent, Division of Blister Rust Control. All of the field work reported herein has been undertaken by George E. Fraser, Agent.

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Individual bush treatments: According to the 1932 check, all individual bush treatments by methods 8, 9, and 10 (see below) were still 100 per cent effective, though some changes in the 1931 data were noted for several bushes treated by other methods. Of these changes the following are the more important: Bushes treated with arsenous oxide by method (2) produced shoots several inches below the portion treated; and bushes treated with copper complex by method (3) produced shoots one inch from the crown on a large root. Each of the chemicals, ammonium chloride, ferrous ammonium sulphate, pitch oil, and phenol applied according to method (1) resulted in one additional live bush the second year after treatment. Method (2) resulted in four new sprouts according to the 1932 check; method (3) showed a decrease of four in the number of live bushes, method (4) a decrease of two bushes, method (5) an increase of two, method (6) an increase of one, and method (7) an increase of one.

B. Results of 1931 Individual Bush Treatments at Pennsylvania Furnace, Pa.

Although an effective spray would be of value for the eradication of small barberry bushes from heavily populated areas, it has been recognized that by far the greatest portion of the barberry eradication program is concerned with the destruction of single bushes. For this reason, considerable attention was given to individual bush treatments both at Maumee, Ohio, and at Pennsylvania Furnace. In Table No. 1 are summarized the results of the 1931 individual bush treatments at Pennsylvania Furnace, Pennsylvania.

Methods of Application Used in Individual Bush Treatments at Maumee, Ohio, 1930, and at Pennsylvania Furnace, Pa., in 1931.

1. Bush cut off through crown, groove cut in crown, filled with paste (1-5 grams). The word "crown" as used in this report refers to that part of the stem which is at the base of the plant and immediately above the juncture of the roots with the stem.

2. Bush cut off through crown, hole bored with a three-sixteenths-inch bit and filled with paste (1-5 grams).

3. Crown lacerated and large roots exposed, small quantity of saturated solution (2-4 cc.) applied.

4. Top left intact, hole bored into crown and filled with a paste (1-5 grams).

5. One stem cut off at crown, groove cut in crown and filled with a paste (1-5 grams).

6. One stem cut off, piece of rubber tubing fitted on and filled with a saturated solution (5-20 cc.).

7. Crown grubbed out; paste applied to root ends thus exposed.

8. Surface litter at base of plant removed; a chemical in aqueous solution or solid form applied to soil about crown.

9. Surface litter at base of plant removed; 50 to 75 per cent of surface of exposed portions of roots and crown lacerated; a chemical in saturated aqueous solution or solid form applied to exposed roots and crown.

10. Surface litter at base of plant removed. Stem cut off through crown and chemical either as a solid or in aqueous solution applied about crown.

For the sake of brevity and clarity in subsequent discussion, the ten methods of individual bush treatment are grouped under four general methods. They may be described as follows: (1) Application of an aqueous solution or solid chemical to the soil around the crown; (2) subsurface application of gaseous chemicals; (3) application of small volumes of concentrated solution by tubulation; and (4) injection of a glycerine paste into stems by means of a special tool.

TABLE NO. 1

RESULTS OF 1931 INDIVIDUAL BUSH TREATMENTS MADE AT PENNSYLVANIA FURNACE, PENNSYLVANIA
DATA TAKEN IN 1932

Plot Numbers	Chemical Used and Concentration (By Volume)	Quantities Applied			Linear Feet Live Stem Treated	Number Bushes Treated	Per Cent Live Stem Killed	Per Cent Bushes Killed	Method of Application	Date of Application
		Average cc. Per Bush	Average Grams Per Bush	Average Grams Per 100 Feet Live Stem						
B1	Acetochloramide 20%	25	5.0	7.0	75	1	29	0	2	August 1
C(3,4,5), B(5,6,7)	Ammonium thiocyanate 10%	84	8.4	2.4	3,475	10	58	10	2	July 14,15,25
C(2,3,4,5,6), B(5,6,7), Outside Area	Ammonium thiocyanate 25%	101	25.2	4.7	6,525	12	73	83	2	July 14,15,23,25,29
A15	Ammonium thiocyanate 30%	725	218.0	43.6	500	1	100	100	4	July 15
B(21,22)	Ammonium thiocyanate Saturated Solution	944	522.0	41.8	2,500	2	99	50	4	July 23
B(21,25)	Ammonium thiocyanate 40%	2,956	1,18[illegible].0	87.6	10,800	8	99	63	5	July 25, August 25
B18, C18	Ammonium thiocyanate 40%	3,453	1,381.0	78.9	7,000	4	99	75	6	August 31
C20	Ammonium thiocyanate 30%	236	70.8	3.7	1,900	1	98	0	7	July 23
B18, Outside Area	Ammonium thiocyanate 40%	195	78.0	10.8	1,450	2	91	0	7	July 15, 30
C21	Ammonium thiocyanate Saturated Solution	354	195.0	9.3	2,100	1	98	0	7	July 23
A19	Ammonium thiocyanate Solid	-	400.0	100.0	400	1	100	100	8	July 15
$A_1$20	Ammonium thiocyanate 5%	118	6.0	18.9	1,000	32	20	0	10	July 23
C(3,5)	Atlacide 10%	163	16.0	5.0	650	2	29	0	2	July 14
C4	Atlacide 25%	50	13.0	5.0	250	1	86	0	2	July 14
A17	Atlacide 30%	1,000	300.0	50.0	600	1	97	0	4	July 15
A(17,18)	Atlacide 40%	912	365.0	77.0	5,200	11	100	100	5	July 31
B17	Atlacide 30%	30	9.0	4.0	450	2	17	0	7	July 15
A15	Atlacide Solid	-	600.0	100.0	600	1	100	100	8	July 15
B23	Atlacide 10%	4,730	473.0	54.6	900	1	44	0	10	July 23
B10	Chlorhydrin 20%	159	32.0	10.6	600	2	76	0	3	August 8
B(10,12,22), C(16,17,20)	Chlorhydrin 40%	104	42.0	10.6	12,550	32	85	34	3	July 14,31; August 12,13, 14; September 2,3
B(6,7), C(2,4,5)	Copper Complex 10%	158	16.0	4.2	2,650	7	58	0	2	July 14,15,25
B(6,7), C(2,3,4,5,6)	Copper Complex 25%	78	20.0	5.2	3,025	8	58	0	2	July 14,15,25
Outside Area	Copper Complex 35%	80	28.0	5.1	4,325	8	29	0	2	July 29,30
C(10,11,16,19,20,24,2, 3,4,5,12,13,21), B(9, 10,11,12,1,2,3,4,5,6,7, 8,24,13), A(7,8) Creek Bank	Copper Complex 35%	111	39.0	9.8	60,110	167	94	43	3	August 3,5,6,7,8,10,12, 13,14,20,21,25,26,27; September 1,2
C(10,11,20,21,23,17,18, 19), B(3,6,9,11,12,22, 23,24,19) Creek Bank	Copper Complex 40%	146	58.0	10.2	45,820	80	97	13	3	August 6,7,14,21,28,29, 31; September 1,2,3
A18	Copper Complex 40%	475	190.0	110.0	175	1	17	0	4	July 14
B26	Copper Complex 40%	278	111.0	51.0	3,700	17	81	35	5	July 24
B25	Copper Complex 40%	2,600	1,040.0	65.0	1,600	1	99	0	6	September 3
A18	Copper Complex Solid	-	1,355.0	104.0	1,300	1	20	0	8	July 15
C(4,18)	duPont 5%	184	9.0	2.4	1,925	5	58	0	2	July 14,31
A15	duPont 5%	2,500	125.0	55.5	225	1	85	0	4	July 15
C18	duPont 5%	115	6.0	0.9	1,400	2	7	0	7	July 31
B(8,17)	duPont Solid	-	493.0	118.0	1,250	3	34	33	8	July 15, August 14
B18	duPont 5%	500	25.0	7.1	350	1	98	0	10	July 15
B(18,22), Outside Area	Ethylene Oxide 100%	328	294.0	35.4	14,928	18	100	100	9	August 4,5,11
C19	Propylene Oxide 12.5%	100	13.0	5.2	250	1	97	0	2	July 31
C18, B18	Propylene Oxide 25%	97	24.0	8.0	900	3	62	33	2	July 23, 31
C18	Propylene Oxide 100%	8	7.0	5.5	125	1	33	0	2	July 23
C19	Propylene Oxide 100%	150	129.0	26.0	500	1	100	100	9	July 23
B(18,19)	Sodium Chloride Solid	-	11,333.0	1,545.0	2,200	3	100	100	8	July 17
Outside Area	Sulform 50%	27	14.0	5.3	750	3	10	0	2	July 30
Outside Area	Sulform 100%	20	20.0	20.0	100	1	56	0	2	July 30
A17	Sulform 100%	194	194.0	91.0	850	4	58	50	4	July 31
Outside Area	Sulform 25%	756	189.0	84.0	225	1	5	0	10	July 30
Outside Area	Sulform 100%	284	284.0	378.0	75	1	17	0	10	July 30
C22, B(18,19), Outside Area	Sulfur Dioxide Gas	-	918.0	233.0	8,680	22	37	14	9	July 30; August 5,11,12
A(16,17,19), B(14,21, 22)	Zinc Ammonium Chloride 40%	1,228	491.0	140.0	7,000	20	92	75	5	July 31, August 21
A15	Zinc Ammonium Chloride Solid	-	367.0	110.0	1,000	3	26	0	8	July 31

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The order of the four general methods as given in the preceding paragraph arranges them in decreasing order of practicability for field use. In the first group chief interest centered about the toxicity of ammonium thiocyanate. Data in Table No. 1 show that, in the quantities used, this chemical did not effect consistently good kill. Zinc ammonium chloride and copper complex might be similarly described. As a killing agent, the concentrated aqueous solution of these chemicals was superior to the dry form. Even distribution of the chemical over the ground immediately superjacent to roots seems to be quite important and is apparently accomplished better with the concentrated aqueous solution than with the solid.

Although ethylene oxide was 100 per cent effective, it cannot be recommended for general field use. Since the chemical must be applied in a series of holes about the bush as a subsurface application, its use would be limited to those sites in which the soil was loose enough to allow a prod rod to enter, and moist enough to retain the highly volatile chemical. Hard clay surfaces, rocky ledges, and very rocky ground would represent some of the more difficult conditions for application. Propylene oxide, which has a higher boiling point than ethylene oxide, might be more practical if it could be produced cheaply enough. The other chemicals tried by this method did not prove to be of any value.

The third general method, that of tubulation, was given quite an extensive trial. This treatment, of course, is applicable only to large bushes, and was given a test because of its possible use on estates and parks where it is necessary to keep the chemical confined strictly to the bush treated. Of several chemicals tested in 1931, copper complex proved to be most suitable for tubulation because of its rapid entry and ready movement through the stems and roots. The results of the 1932 check, however, made it apparent that the quantity of chemical indicated in Table No. 1 was not sufficient to ensure death.

A specially designed tool for injecting a glycerine, copper complex paste was also given a trial. Experience showed this method to be so unsatisfactory that no further tests are contemplated.

C. Results of 1931 Spraying Experiments at Pennsylvania Furnace, Pa.

On the basis of results secured from the 1931 check of the Kansas experiments, additional spraying tests were made at Pennsylvania Furnace, Pennsylvania, in July and August of the same year. The Pennsylvania plots were checked in June of 1932 with the results as shown in the following table:

The order of the four general methods as given in the preceding paragraph arranges them in decreasing order of practicability for field use. In the first group chief interest centered about the toxicity of ammonium thiocyanate. Data in Table No. 1 show that, in the quantities used, this chemical did not effect consistently good kill. Zinc ammonium chloride and copper complex might be similarly described. As a killing agent, the [illegible] to the dry form. Even distribution of the chemical over the ground immediately superjacent to roots seems to be quite important and is apparently accomplished better with the concentrated aqueous solution than with the solid.

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The third general method, that of tubulation, was given quite an extensive trial. This treatment, of course, is applicable only to large bushes, and was given a test because of its possible use on estates and [illegible] movement through the stems and roots. The results of the 1952 check, however, made it apparent that the quantity of chemical indicated in Table No. 1 was not sufficient to ensure death.

A specially designed tool for injecting a glycerine, copper complex paste was also given a trial. Experience showed this method to be so unsatisfactory that no further tests are contemplated.

C. Results of 1951 [illegible] Experiments [illegible]

On the basis of results secured from the 1951 check of the [illegible] experiments, additional spraying tests were made in [illegible] Pennsylvania, in July and August of the same year. [illegible] were checked in June of 1952 with the results as shown in the following table:

TABLE NO. 2

RESULTS OF 1931 SPRAYING EXPERIMENTS PERFORMED AT PENNSYLVANIA FURNACE, PENNSYLVANIA
DATA TAKEN IN 1932

Plot Number	Date of Treat- ment	Chemical Used	Concen- tration (a) in Pounds Per Gallon		Gallons Used	Number Bushes Treated	Live Stem Treated Linear Feet	Quantity Applied				Live Stem Killed Per Cent	Bushes Killed Per Cent
								Gallons Per Bush	Gallons Per 100 Feet Live Stem	Pounds Per Bush	Pounds Per 100 Feet Live Stem		
					BARBERRY								
C23	7/18/31	Atlacide (b)	0.45		5.25	41	5,850	0.13	0.09	0.059	0.04	44	49
$B_2$23	7/18/31	Atlacide	0.45		2.00	3	2,340	0.67	0.09	0.300	0.04	31	0
$B_1$23	7/17/31	Atlacide (b)	0.89		8.00	50	8,110	0.16	0.10	0.140	0.09	54	22
$B_2 23_1$	7/18/31	Atlacide	0.89		2.00	23	3,828	0.09	0.05	0.080	0.04	55	35
$B_1 23_1$	7/17/31	Atlacide (b)	1.40		5.50	57	7,003	0.10	0.08	0.140	0.11	63	44
$B_1 23_2$	7/17/31	Atlacide	1.40		1.75	14	2,478	0.13	0.07	0.180	0.10	38	14
A10	7/24/31	Atlacide (b) + Glue (c)	1.40	0.05	2.00	245	606	0.0082	0.33	0.012	0.46	82	25
$B_3 24_1$	7/16/31	Atlacide (b)	2.00		4.00	32	2,730	0.13	0.15	0.260	0.30	99	78
$B_2 24_1$	7/16/31	Atlacide	2.00		2.88	27	2,392	0.11	0.12	0.220	0.24	92	63
$C9_1, B_1 9_1$	7/24/31	Atlacide (b) + Glue (c)	2.00	0.05	1.00	85	312	0.012	0.32	0.024	0.64	98	85
$B_1$22	8/25/31	Atlacide (b)	2.00		5.50	41	3,407	0.13	0.16	0.260	0.32	100	95
$C_1$20	8/28/31	Atlacide (b)	2.70		5.50	45	4,460	0.12	0.12	0.320	0.32	97	87
$C_2 16_1$	8/29/31	Atlacide	2.70		1.40	12	1,192	0.12	0.12	0.320	0.32	100	100
A17	8/29/31	Atlacide (b)	2.70		1.00	61	318	0.016	0.31	0.043	0.84	100	97
$C_1$17	8/29/31	Atlacide (b)	3.40		5.75	84	5,301	0.068	0.11	0.230	0.37	100	95
$C_1 16_1$	8/29/31	Atlacide	3.40		1.60	20	1,740	0.08	0.09	0.270	0.31	99	75
$B20_1$	7/18/31	Ammonium thiocyanate	0.45		4.50	173	2,360	0.03	0.19	0.014	0.09	58	0
B20	7/24/31	Ammonium thiocyanate + Glue (c)	0.45	0.05	2.25	691	2,247	0.0033	0.10	0.002	0.05	46	13
$B_1 20_1$	7/18/31	Ammonium thiocyanate	1.40		4.00	126	3,540	0.03	0.11	0.040	0.15	82	7
$B_1$21	8/24/31	Ammonium thiocyanate	1.80		5.00	51	5,350	0.098	0.09	0.130	0.16	78	16
$C20_1$	7/18/31	Ammonium thiocyanate	2.70		6.00	117	4,970	0.05	0.12	0.140	0.32	89	40
$C21, C_1 22_1$	8/24/31	Ammonium thiocyanate	2.70		7.75	59	8,925	0.13	0.09	0.350	0.24	96	42
$B_3 21_2, B_2 22$	8/24/31	Ammonium thiocyanate	3.40		6.50	54	6,648	0.12	0.10	0.410	0.34	98	67
$B6, B7, A_1 7_1, B_1 8_1$	9/3/31	Diesel oil	100.00		10.00	197	8,100	0.05	0.12	0.350	0.83	64	18
$C18_1$	7/20/31	Furnace oil	100.00		5.00	Results very poor; no date taken.							
$B_1 8_1, B_1 9$	8/29/31	Furnace oil	100.00		3.75	55	3,460	0.068	0.11	0.450	0.74	65	29
B11	8/29/31	Furnace oil + Cresylic acid	98.00	2.00	3.00	475	1,950	0.0063	0.15	0.042	1.01	28	18
A9	7/20/31	Furnace oil + Cresylic acid	96.00	4.00	1.00	99	1,038	0.010	0.10	0.070	0.67	31	0
C15	7/20/31	Furnace oil + Phenol	98.00	2.00	1.38	57	4,250	0.024	0.03	0.160	0.20	16	0
C13	7/20/31	Furnace oil + Pyridine	98.00	2.00	1.00	75	3,158	0.013	0.03	0.090	0.20	20	0
$B_1 9_1$	8/29/31	Furnace oil + Pyridine	95.00	5.00	3.00	109	3,301	0.028	0.09	0.190	0.60	71	9
					POISON IVY								
3	7/20/31	Atlacide	1.40		0.12	Very little reduction in number of plants.							
4	7/20/31	Atlacide	0.89		0.25	Very little reduction in number of plants.							
5	7/20/31	Atlacide	0.45		0.25	Very little reduction in number of plants.							
(d)	8/6/31	Atlacide	2.70		1.25	Estimated 98 to 99 per cent kill.							
2	7/20/31	Ammonium thiocyanate	0.45		0.25	Very little reduction in number of plants.							
(e)	8/20/31	Ammonium thiocyanate	2.00		0.75	Estimated 85 to 90 per cent kill.							
1	7/20/31	Furnace oil + Cresylic acid	93.00	2.00	0.05	Very little reduction in number of plants.							

(a) Concentration as given for oil sprays is per cent by volume.
(b) Buffered to pH 6.5 by Chipman Chemical Engineering Company.
(c) Seedling plot sprays.
(d) On plot outside experimental area in Mr. George Irwin's pasture.
(e) On plot outside and east of north end of experimental area.

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Examination of the data in Table No. 2 shows that for Atlacide (0.89 to 3.4 pounds per gallon of water) the resultant per cent kill varied between 22 and 100. In the 1930 tests at Maumee, Atlacide (1.4 to 3.4 pounds per gallon of water) killed 98 to 100 per cent of the bushes. The same year sodium chlorate (0.45 to 2.7 pounds per gallon) accounted for 96 to 100 per cent of the bushes. Several reasons are advanced to explain these apparent discrepancies. The unusual drought experienced at Maumee in 1930 undoubtedly contributed in part to the mortality of bushes. It is also true that the bushes at Maumee were generally much smaller and less vigorous than those treated at Pennsylvania Furnace. Perhaps the most important factor which influenced results was the lower dosages used at Pennsylvania Furnace. For the above mentioned range of concentrations, Atlacide was used at Pennsylvania Furnace in dosages varying from 0.04 to 0.84 pounds per 100 feet of live stem. At Maumee, Atlacide was applied at the rate of 0.80 to 1.26 pounds per 100 feet of live stem for the concentration range noted above.

Ammonium thiocyanate was used for the first time at Pennsylvania Furnace in 1931. Reference to Table No. 2 shows that the killing action of aqueous Atlacide or ammonium thiocyanate spray on barberry is determined partly by the weight of chemical per 100 feet of live stem and partly by the concentration of the spray solution. Apparently there exists a certain minimum concentration for effective spray work. Data in Table No. 2 show that ammonium thiocyanate is less toxic pound for pound than sodium chlorate.

On the basis of the 1931 tests at Pennsylvania Furnace and the 1930 tests at Maumee, oil sprays can be definitely ruled out of consideration as killing agents.

D. Spraying Experiments Undertaken at Pennsylvania Furnace in 1932

Owing to limited time and man power, only two chemicals were tested by spray application at Pennsylvania Furnace in 1932. Efforts were confined to a study of the minimum amount of ammonium thiocyanate and Calcium Chloron, a proprietary chemical, required per 100 feet of stem to ensure death. The latter chemical compound was tested largely because of the claims advanced by its manufacturer. The plan of experimentation called for the application to different plots of one concentration and different volumes of solution per 100 feet of stem. The method was not entirely successful as considerable difficulty was encountered in making the pump consistently deliver the same volume of solution with each stroke. Had time permitted, it was hoped to make the experiment extensive enough to show the most efficient concentration and the minimum poundage of chemical per 100 feet of stem for complete kill. Table No. 3 gives a summary of these experiments.

Examination of the data in Table No. 2 shows that for Atlacide (0.39 to 3.4 pounds per gallon of water) the resultant per cent kill varies between 22 and 100. In the 1930 tests at Maumee, Atlacide (1.4 to 3.4 pounds per gallon of water) killed 98 to 100 per cent of the bushes. The same year sodium chlorate (0.45 to 2.7 pounds per gallon) accounted for 96 to 100 per cent of the bushes. Several reasons are advanced to explain these apparent discrepancies. The unusual drought experienced at Maumee in 1930 undoubtedly contributed in part to the mortality of bushes. It is also true that the bushes at Maumee were generally much smaller and less vigorous than those treated at Pennsylvania Furnace. Perhaps the most important factor which influenced results was the lower dosages used at Pennsylvania Furnace. For the above mentioned range of concentrations, Atlacide was used at Pennsylvania Furnace in dosages varying from 0.04 to 0.84 pounds per 100 feet of live stem. At Maumee, Atlacide was applied at the rate of 0.80 to 1.26 pounds per 100 feet of live stem for the concentration range noted above.

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TABLE NO. 3

SUMMARY OF SPRAYING EXPERIMENTS PERFORMED AT PENNSYLVANIA FURNACE, PENNSYLVANIA IN 1932

Plot Numbers	Date of Appli-cation	Chemical Used	Conc. in Lbs. Per Gal.	Bushes Treat-ed Number	Live Stem Treated Linear Feet	Quantity Applied Total Gals.	Gals. Per 100' Live Stem	Lbs. Chemical Per 100' Live Stem
0^1B^1, OB, OC	7/15/32	Ammonium thiocyanate	0.89	37	4,995	17.29	0.35	0.31
1B	do.	do.	0.89	32	1,555	6.30	0.40	0.36
1C	7/16/32	do.	0.89	4	725	3.60	0.50	0.44
2C	7/18/32	Calcium Chloron*	0.89	42	1,301	6.50	0.50	0.44
2B	do.	do.	0.89	68	1,475	6.75	0.46	0.40
2B	7/19/32	do.	0.89	21	141	1.87	1.32	1.18
3B	do.	do.	1.40	105	1,689	10.50	0.62	0.87

* Proprietary weed killer made by the New England Lime Co., of Pittsfield, Mass.

E. Soil Application Experiments Undertaken at Pennsylvania Furnace, Pa., in 1932

Considerable attention was given to soil application of chemical in solid and aqueous form, since earlier experiments indicated that a method of soil treatment would require less chemical and would involve less labor than spraying. Sodium chlorate, ammonium thiocyanate, and Calcium Chloron were selected for a field trial of the effectiveness of soil applications. Calcium Chloron, a proprietary compound, was included in the experimental tests to evaluate the attractive week killing properties claimed by its manufacturers. Preliminary tests, however, did not substantiate some of these claims. It is very objectionable to handle either as a solid or in solution because of the evolution of copious fumes of chlorine and, consequently, cannot be considered as a practical substance for future work in the chemical suppression of barberry.

Sodium chlorate solution was applied about the base of the bush by means of a knapsack spray unit. The whirl disk was removed from the spray nozzle to allow more rapid flow of solution. To minimize the fire hazard, all of the soil applications of sodium chlorate were made in aqueous solutions containing not more than 0.89 pounds of sodium chlorate per gallon. Ammonium thiocyanate and Calcium Chloron were applied in similar

fashion and in the same concentration. Since previous experience showed that ammonium thiocyanate was less toxic than sodium chlorate, the former chemical was used in larger quantities per 100 feet of live stem.

Soil applications of the dry form of these chemicals were made according to the technic used in the regular salting treatment. In the application of solid ammonium thiocyanate the dosage was prescribed partly on the results of laboratory tests on the comparative toxicity of sodium chlorate and ammonium thiocyanate and partly on the results of some preliminary field tests made by Dr. W. W. Melander, State Barberry Leader of Minnesota. Although application of solid sodium chlorate cannot be considered for regular field use because of the fire hazard involved, a few bushes were so treated to complete the series of experiments on a comparable basis.

A field assignment in Wisconsin prevented Draper from performing a late-season check on the 1932 experiments at Pennsylvania Furnace. A summary of these experiments is presented in Table No. 4:

TABLE NO. 4

SUMMARY OF SOIL APPLICATION EXPERIMENTS UNDERTAKEN AT PENNSYLVANIA FURNACE, PENNSYLVANIA, IN 1932

Bush Numbers (Inclusive)	Date of Application	Chemical Used	Conc. in Lbs. Per Gal.	Bushes Treated Number	Live Stem Treated Linear Feet	Area of Ground Surface Treated Square Feet	Quantity Applied: Total Gals. Spray or Lbs. Chemical	Quantity Applied: Lbs. Chemical per 100 Feet of Live Stem	Quantity Applied: Lbs. Chemical Per Sq. Foot of Ground Surface
1-30	7/12	Sodium chlorate	0.89	30	13,050	N.R.*	25.41	0.17	N.R.
31-45	7/13	Calcium Chloron	0.89	15	4,550	N.R.	8.14	0.18	N.R.
46-75	7/14	Ammonium thiocyanate	0.89	30	6,400	N.R.	17.14	0.24	N.R.
76-85	7/18	do.	Solid	10	7,875	23.87	60.00	0.76	2.5
86-87	7/18	Calcium Chloron	Solid	2	1,500	3.80	11.00	0.73	2.9
88-92	7/18	Sodium chlorate	Solid	5	2,900	7.59	15.00	0.52	2.0
93-95	7/20	Ammonium thiocyanate	Solid	3	775	2.76	7.00	0.90	2.5

*No record.

F. Tubulation Experiments Undertaken at Pennsylvania Furnace in 1932

Further experiments were undertaken in which heavily paraffined paper tubes were applied to cut-off stems and then filled with concentrated aqueous solutions of sodium chlorate and ammonium thiocyanate. The inconsistent results of earlier experiments suggested that a lethal dose of copper complex had not been attained; for this reason, both the number of tubes and the quantity of chemical per 100 feet of stem were doubled and trebled over those used in 1931. Sodium chlorate was not used in the 1931 experiments. Atlacide was given a trial, but it apparently contained insoluble ingredients that prevented the solution from entering the stem readily. Concentrated sodium chlorate solutions were given preliminary trial in 1932 and they compared so closely in the rate of entry with concentrated aqueous copper complex that a large number of bushes was tubed. To determine the relative merits of sodium chlorate and copper complex, they were used in about the same quantity per 100 feet of live stem. The results of these tests are given in Table No. 5:

TABLE NO. 5

SUMMARY OF TUBULATION EXPERIMENTS PERFORMED AT PENNSYLVANIA FURNACE, PENNSYLVANIA, IN 1932

Plot Numbers	Date of Applica -tion	Chemical Used	Conc. in Per Cent by Volume	Bushes Treat-ed Number	Live Stem Treat -ed Linear Feet	Quantity Applied			
						Total Volume Solu-tion cc.	Total Weight Chemi-cal Grams	Volume Per 100' of Live Stem cc.	Weight Per 100' Live Stem Grams
B14, $B_2$21	7/21,22, 26,29	Sodium chlorate	54.0	16	5,775	2,129	1,149	36.9	19.9
C17	7/28	do.	54.0	11	3,525	2,460	1,330	69.8	37.7
$B_2 21_1$	7/29	do.	38.0	1	800	560	213	70.0	26.6
C14,C15 B17	7/27, 7/28	do.	28.6	35	5,805	4,143	1,184	71.0	[illegible].4
$C_1$17 $C18_1$	7/28	Copper complex	47.6	13	2,940	1,909	909	64.9	30.9
C18	7/29	do.	30.0	18	2,825	1,874	563	66.3	19.9

G. Treated Bushes Grubbed at Pennsylvania Furnace, Pa., in 1932

In order to determine the condition of the roots that had been treated in 1931, a number of bushes were grubbed out and examined with results as noted in Table No. 6.

TABLE NO. 6

OBSERVATIONS MADE ON BUSHES TREATED IN 1931 AND GRUBBED OUT IN 1932, PENNSYLVANIA FURNACE, PA.

Date Treated	Date Grubbed	Bush No.	Treatment Number	Chemical Formula (Conc. by volume.)	Observations
8/27/31	7/8/32	449	3	Copper Complex 35%	Large mass of feeding roots close to surface. Spreading fan-like root system. One 3/8" root and one 1/4" root sending up shoots close to crown. Chemical had killed down into the large roots at least 18". Small roots and feeding roots around crown either partially discolored or not affected.
8/26/31	7/8/32	436	3	Copper Complex 25%	Large vertical tap root. Only one small feeding root close to surface. Tap root branched 14" below surface. All roots, stems, and crown show definite killing action of chemical. No sprouts.
7/21/31	7/8/32	172	5	Atlacide 40%	Unearthed one root 1/2" in diameter one foot below surface and $2\frac{1}{2}$ to 3 feet from crown on uphill side of bush. Another root 1/4" diameter, much branched, 6" below surface and 3 feet from crown. Both roots entirely blackened. No other roots found to that depth on that side of bush.
7/17/31	7/8/32	370	8	Common Salt Solid	Unearthed several roots 1/4" diameter 3" below surface and 2 to $2\frac{1}{2}$ feet from crown. Entirely dead. One root 1/2" diameter 2" below surface. Dead up to $2\frac{1}{2}$ feet from crown. Beyond that point it was living.
8/31/31	7/8/32	530	6	Ammonium Thiocyanate 40%	One group of sprouts coming from root 1/2" diameter one foot below surface and $2\frac{1}{2}$ feet from crown. Roots seem to be alive beyond one foot from crown. One 3/8" root 10" below surface dead at least $2\frac{1}{2}$ feet from crown.
7/18/32	7/28/32	30	8	Ammonium Thiocyanate 10%	Roots exposed on uphill side of bush. One 1/4" root 8 to 10" below surface well blackened to distance of 2 feet from crown. Some small roots show evidence of chemical injury 18" from crown while still other show injury beyond 18" from crown. Some of these roots are within 6" of the surface.
7/14/32	7/25/32	57	4	Ammonium Thiocyanate 10%	Entire plant dug up. Large perpendicular tap root. Killed down at least 18" to 2 feet from crown. Most of branch roots killed 18" to 2 feet from crown.

H. The Growth of Beans Planted in Plots Treated with Toxic Chemicals

In order to obtain some preliminary idea of the length of time that certain chemicals remained as toxic substances in field soils, square foot plots were treated with 1/3, 2/3, and 1 quart each of 40 per cent solutions of the following chemicals: ammonium thiocyanate, Atlacide, and zinc ammonium chloride. The plots were treated in August, 1931. Beans were planted in these plots on July 9, 1932, and notes were taken three weeks later. The beans germinated and showed good growth on all plots except those treated with zinc ammonium chloride. On these plots many of the beans molded while those that germinated had thick, club-shaped radicles and short branched roots. The leaf stocks were very short.

I. Practical Field Tests Undertaken at Maumee, Ohio, in 1932

During the last two years numerous chemicals have been tested on common barberry at Maumee, Ohio, and Pennsylvania Furnace, Pennsylvania, by several methods of application. With the results of these tests at hand, it seemed advisable to undertake an eradication job with one or more of the most effective chemicals according to the best known field practice for each chemical. Sodium chlorate and ammonium thiocyanate were finally selected as the best chemicals for such tests. Incidentally, preliminary data were to be secured for comparing the eradication cost by chlorate and thiocyanate with that of common salt. An area at Maumee, Ohio, was chosen by Mr. F. C. Meier for the proposed field test.

The use of sodium chlorate as a weed killer has been open to some criticism on account of its toxic properties to animals and the fire hazard it creates. To minimize these dangers, a concentration of 0.89 pounds per gallon was not exceeded for any method of treatment. By using a subsurface drench it was thought that much time could be saved and the fire hazard and danger to stock could be largely eliminated.

Ammonium thiocyanate is one of the newer chemicals to be used on Ribes and barberry, and although its toxicity had not been fully demonstrated for barberry it was included in the field demonstration because of its desirable properties as a weed killer. Among these might be noted low toxicity to animals and non-inflammability. It is also an excellent agricultural poison since the toxic effect on soil is quite transient. After the thiocyanate has decomposed the products of decomposition exert a beneficial action on the soil. In the early stages of toxic effect a sterilizing action on seeds has been reported. These favorable properties place ammonium thiocyanate high in the scale of acceptability as a substitute for common salt which is now used in very large amounts to ensure kill.

In testing the commercial grade of ammonium thiocyanate at Mames considerable difficulty was experienced in spreading the sticky chemical evenly around the plant crown. Since small quantities of thiocyanate must be used if it is to compare favorably on a cost basis with common salt, a test was made of mixtures of ammonium thiocyanate with an inert material as a spreading medium. Sawdust was used for this purpose. It is light, absorbent and granular in structure and can be readily obtained in large quantities. Wheat chaff is being investigated as a substitute for sawdust since it is reasonable to assume that the former would be even more available than sawdust in farming communities.

Ammonium thiocyanate was applied as a subsurface drench and as a combination aerial spray and subsurface drench for comparison with sodium chlorate. Since laboratory and greenhouse tests indicated that the thiocyanate is less toxic pound for pound than sodium chlorate, a stronger solution of thiocyanate was used.

Subsurface applications were made with a knapsack spray tank on which a special extension rod with a pointed steel tip replaced the usual light extension and spray nozzle. For the smaller bushes the prod was thrust barely into mineral soil in a number of places about the crown; for the larger bushes this treatment was supplemented by a ring of holes 4 to 6 inches away from the crown.

All spraying was done with the regular knapsack spray unit. The aerial parts of the plant were well wetted and in addition the soil immediately about the crown was soaked. Sprays, supplementary to subsurface drenches, were made just heavy enough to wet the foliage.

Solid applications of chemical were made with a wooden spatula. The chemical was spread as uniformly as possible in a circle about the crown for a distance of 2 to 6 inches, depending upon the size of the bush. Sawdust mixtures were added by hand from a pail or poured on the crown of the plant and allowed to form a cone with the crown of the bush as the center.

A summary of these experiments is given in Table No. 7. Tentative cost figures are presented in Table No. 8.

TABLE NO. 7

SUMMARY OF CROWN APPLICATION AND SPRAYING EXPERIMENTS PERFORMED AT MAUMEE, OHIO, IN 1932

Plot Numbers	Date of Application	Chemical Used	Conc. in Lbs. Per Gal.	Method of Application	Bushes Treated Number	Quantity Applied Lbs.	Quantity Applied Gals.	Time Required For Application
Area II 6(G,K,O), 17J, H(7,8), OE	8/6,11	Ammonium thiocyanate	Solid	Crown application	254	131.0	*N.R.	4 hrs. 20'
Area II G(5,16), I(5,6)	8/6,11	Ammonium thiocyanate + sawdust	Solid 1 : 1	do.	34	13.5	N.R.	1 Hr. 15'
Area II 14D, 15B		Ammonium thiocyanate	1.40	Subsurface drench + aerial spray	494	41.6	29.75	5 hrs. 53'
Area II 3H, 12H, 13(B,C,D,E,F,G,H), 14(A,B,C,E,F,G,H), 15C, 15D, 15(E,F,G, I,J), 15H, 16I, 17G, 18I	8/8,9,10, 11	Ammonium thiocyanate	1.40	Subsurface drench	890	52.5	37.50	11 hrs. 13'
Area I 2C, 3C, A(0, 1,2,3,4), B(0,1,2,3, 4)	8/12	Sodium chlorate	0.89	Subsurface drench + aerial spray	116	11.1	12.50	3 hrs. 34'
Area I 2E, OE, OF, Area II 9(A,B,C,D,E,F,G,H), 10(B,C,D,F,G,H), 11(A,B,C,D,E,F,G,H), 12(A,B,C,D,E,F,G)	8/13,15	Sodium chlorate	0.89	Subsurface drench	272	13.7	15.30	8 hrs. 4'
Area II 4G, 5(A,B, C,D,E,F,G), 6(A,B,C, D,E,F,G), 6L, 7(A,B, C,D,E,F,G), 8(A,B,D, E,F,G), Check Plot 5L, M(2,3,4), 50, 4I	8/16,17	Sodium chlorate	0.89	Aerial spray	171	9.8	11.00	7 hrs. 51'

* No Record

TABLE NO. 8

COST OF CHEMICAL ERADICATION OF BARBERRY AT MAUMEE, OHIO, IN 1932

Chemical Used	Conc. in Lbs. Per Gallon	Method of Application	Size of Plots Treated Square Chains	Bushes Treated Number	Lbs. of Chemical Used	Time Needed for Treatment Hrs.	Time Needed for Treatment Min.	Cost of Chemical (a) Per Bush	Labor Per Bush Man-Hours
Ammonium thiocyanate	Solid	Crown application	5	254	131.0	4	20	$0.0520	.0170
Ammonium thiocyanate Sawdust mixture	Solid	do.	2-2/3	34	6.8	1	15	0.0200	.0370
Ammonium thiocyanate	1.40	Subsurface drench + aerial spray	2	494	41.6	5	53	0.0084	.0119
Ammonium thiocyanate	1.40	Subsurface drench	26	690	52.5	11	13	0.0076	.0163
(b) Sodium chlorate	0.89	Subsurface drench + aerial spray	10	116	11.1	3	24	0.0096	.0293
Sodium chlorate	0.89	Subsurface drench	31	272	13.7	8	4	0.0050	.0297
(b) Sodium chlorate	0.89	Aerial spray	33-1/3	171	9.8	7	51	0.0057	.0459

(a) Cost of chemical figured at 10¢ per pound on job.

(b) 0.01 per cent glue used as a sticker.

The data for cost of chemical per bush as given in Table No. 8 indicate the possibilities of ammonium thiocyanate and sodium chlorate for field use in the chemical destruction of barberry. It is apparent that the quantity of chemical used as spray or as an aqueous soil drench is considerably less than the amount necessary for application as a solid. Time of treatment, however, decidedly favors the latter type of work. A comparison of the effectiveness of the different types of treatment should be made next summer before deciding on their relative merits. No monetary value has been given for the labor as the work was done without the assistance of a regular crew.

J. Crown Applications of Salt by a Crew at Marshall, Wisconsin, in 1932

Before undertaking a field-scale test of solid applications of ammonium thiocyanate it seemed desirable to learn something about the regular salting methods used by field crews and at the same time obtain some data on the quantities of salt used per bush. This opportunity was provided at Marshall, Wisconsin. The crew of four men was supervised by Mr. Adolph Hendrickson. Table No. 9 presents a summary of some data taken in the course of observation of the working crews.

TABLE NO. 9

CROWN APPLICATIONS OF SALT MADE AT MARSHALL, WISCONSIN, AUGUST 31, 1932

* Number of Bushes	Size Range in Feet Live Stem	Total Live Stem Treated Linear Feet	Total Ground Surface (Equivalent to crown) Treated Square Feet	Total Quantity Salt Applied Lbs.	Lbs. Salt Per 100' Live Stem	Lbs. Salt Per Square Foot Crown	Feet of Live Stem Per Bush Average	Lbs. of Chemical Per Bush Average
16	200-900	6,775	32.16	392.50	5.79	12.2	303	18.7
9	50-200	800	4.59	73.75	9.22	16.1		
8	1-50	126	0.92	29.00	23.01	31.5	12	2.8
10	1-50	91	-	22.00	24.20	-		

* It should be noted that out of the total 147 bushes that were salted, complete data as given in this table were recorded for only 43 bushes.

Table No. 9 presents a summary of the data that were taken on size of bush, size of crown and quantities of salt used in the treatment of a portion of the bushes involved in the field test. Notes were taken on 43 bushes which were considered to be representative of small, medium, and large classes of plants. The entire experiment involved the treatment of 147 bushes for which 1,500 pounds of salt were needed. A 4-man crew and a crew foreman spent two hours on the job. Of these plants, 80 bushes had less than 50 feet of live stem and 67 averaged around 200. The small bush group was treated with about two pounds of salt per bush and the large bush group around 20 pounds per bush.

While working in this area attention was directed to some bushes that had been salted in late June of the current year. Notes were taken on the size of the area about each bush on which grass had been killed by the salt. In general, the grass sod was killed six inches beyond the outer edge of the salt treatment. On steep ground the salt may be washed down so as to kill sod to a distance of two to two and a half feet.

K. Crown Application of Solid Chemicals Applied by a Salting Crew at Trempealeau, Wisconsin, in 1932

In order to study further the application of solid ammonium thiocyanate under field conditions and to compare its use more closely with that of salt, the services of a salting crew, operating out of Trempealeau, were obtained. Suitable areas were selected and reserved for the experiment in advance.

The experiment was conducted by C. E. Draper, assisted by Mr. V. C. Taylor, Barberry State Leader, Mr. Erickson, crew foreman, and a crew of four men. The experiment, arranged for and directed by Mr. F. C. Meier, was performed on September 7.

An area was selected which could be subdivided into chain square plots. Alternate plots were then treated with ammonium thiocyanate and common salt. This plan of application was adopted to reduce as much as possible such variables as searching time, and size and number of bushes.

Instructions were given to the crew on preparing chemicals, methods of application and quantity of chemical to be used. The instruction period was followed by a practice treatment of a few bushes outside the established plots. The salt was carried in the customary manner in bags. One 6-quart bucket was provided for each 2-man crew as an auxiliary carrying unit. Each man was then provided with a 6-inch frying pan to be used as a ladle and spreader. The crew was also instructed to work at the customary rate of speed and to apply the salt at the usual rate per bush.

A summary of field data and tentative cost figures for this experiment is given in Table No. 10.

Table No. 9 presents a summary of the data that were taken on size of bush, size of crown and quantities of salt used in the treatment of a portion of the bushes involved in the field test. Notes were taken on 83 bushes which were considered to be representative of small, medium, and large classes of plants. The entire experiment involved the treatment of 147 bushes for which 1,390 pounds of salt were needed. A 4-man crew and a crew foreman spent ten hours on the job. Of these plants, 37 bushes had less than 50 feet of line each and 57 exceeded around 100. The small bush group was treated with about ten pounds of salt per bush and the large bush group around 20 pounds per bush.

While searching in this area attention was directed to some bushes that had been salted in late June of the current year. Notes were taken on the size of the area about each bush on which grass had been killed by the salt. In general, the grass sod was killed six inches beyond the outer edge of the salt treatment. On steep ground the salt may be washed down so as to kill sod to a distance of two to two and a half feet.

C. Crown Application of Solid Chemicals Applied by a Cutting Crew at [illegible], [illegible], in 1939

In order to study further the application of solid ammonium thiocyanate under field conditions and to compare its use more closely with that of salt, the services of a cutting crew, operating out of [illegible], were obtained. Suitable areas were selected and reserved for the experiment in advance.

The experiment was conducted by G. E. Draper, assisted by Mr. W. C. Taylor, Barberry State Leader, Mr. [illegible], Crew Foreman, and a crew of four men. The experiment, arranged for and directed by Mr. [illegible], was performed on September 7.

An area was selected which could be subdivided into eight square plots. Alternate plots were then treated with ammonium thiocyanate and common salt. This plan of application was adopted to reduce as much as possible such variables as searching time, and size and number of bushes.

Instructions were given to the crew on preparing chemicals, methods of application and quantity of chemical to be used. The instruction period was followed by a practice treatment of a few bushes outside the established plots. The salt was carried in the customary manner - in bags. One 8-quart bucket was provided for each 2-man crew as an auxiliary carrying unit. Each man was then provided with a 6-inch [illegible] to be used as a ladle and spreader. The crew was also instructed to work at the customary rate of speed and to apply the salt at the usual rate per bush.

A summary of field data and tentative cost figures for this experiment is given in Table No. 10.

TABLE NO. 10

APPLICATION OF SOLID CHEMICALS MADE AT TREMPEALEAU, WISCONSIN, IN 1938

Plot Numbers	Chemical Used	Bushes Treated Number	Live Stem Treated Linear Feet	Total Area of Crown Treated Square Feet	Total Lbs. of Chemical Applied	Lbs. Chemical Per Bush	Lbs. of Chemical Per 100 Ft. Live Stem	Lbs. of Chemical Per Square Foot Crown	Total Time Needed For Treatment Man-Hrs.	Labor Per Bush Man-Hours	Chemical Cost Per Bush (a)	Chemical Cost Per Square Foot of Crown Treated	Labor Per Sq. Ft. Crown Treated Man-Hrs.
Area I Plots 1,3,5,7	Ammonium thiocyanate	35	2,085	7,806	33.5	0.96	1.61	4.29	5.0	0.143	$0.096	$0.43	0.64
Area I Plots 2,4,6,8	Salt	45	2,089	5,583	160.0	3.56	7.67	28.65	2.3	0.051	0.036	0.29	0.41
Area II	Ammonium thiocyanate + sawdust	70	4,345	23,781	51.0	0.73	1.18	2.14	6.9	0.099	0.073	0.21	0.29
Area III	Ammonium thiocyanate	139	-	-	94.0	0.68	-	-	6.0	0.043	0.068	-	-

Weather data on September 7 are recorded as follows: at 9 a.m., 2:30 p.m., and 5:30 p.m., soil temperatures were respectively, 61, 72, and 73; air temperatures 65, 77, and 69; and relative humidity 34, 40, and 55.

(a) Cost of ammonium thiocyanate figured at 10¢ per pound on the job.
Cost of salt figured at 1¢ per pound on the job.

Observations made during the salting work at Marshall indicated that the amount of salt needed for adequate treatment of a bush depends more on the variation in size of crown rather than the variation in feet of live stem. This is rather to be expected from the nature of the application. Thus, the comparative cost figures for solid applications of ammonium thiocyanate and salt at Trempealeau should be examined on a basis of square foot of crown treated. Table No. 10 shows these figures to be about the same both for chemical cost and labor cost. The chief advantage of the ammonium thiocyanate would be in the transportation of much smaller amounts of chemical. The quantity of ammonium thiocyanate used was about 1/7 that of the salt; when mixed with sawdust the amount of thiocyanate applied was around 1/14 of the quantity of salt. Of course, it must be borne in mind that the figures for both ammonium thiocyanate and the sawdust mixture were taken from the work of a crew that had only a few minutes experience with a new chemical and a new method, and that the same crew was quite experienced in the use of salt. This would increase to some extent the time required for the ammonium thiocyanate applications. Attention need hardly be called to the limited scope of this experiment and the danger of accepting cost figures in Table No. 10 as the final statement on the comparative cost of ammonium thiocyanate and sodium chloride.

L. <u>Notes on Areas Salted in Previous Years in the Vicinity of Sauk City, Black Earth, and Spring Green, Wisconsin.</u>

A number of bushes treated by crown application of ammonium thiocyanate at Pennsylvania Furnace sent up sprouts from roots some distance back from the crown. It was also noted that a large bush treated with salt had some roots showing signs of life a year after the time of treatment. For this reason, a trip was planned to several barberry areas close to Madison, Wisconsin, which had been salted in previous years to find out if any of these bushes were reestablishing themselves from live roots. It was also planned to study the effect of the salt on nearby vegetation. The trip was conducted by Mr. Adolph Hendrickson, who had originally supervised the salting of a large share of the areas.

<u>Area 1.</u> Located on Mr. Harvey Taylor's ranch east of Sauk City. All bushes were dead, with the exception of one large bush located on a gently sloping sandy hillside. This bush, 10 feet high with 500 to 600 feet of dead stem, had received about 100 pounds of salt. Several sprouts were found on the uphill side of the bush at a distance of 4 to 6 feet from the crown. No sprouts were found on either side of or downhill from the bush.

Area 2. Located across Highway 12, north of Mr. Taylor's ranch. It contained a number of very large bushes two of which were sending up shoots from living roots. In one case the sprout appeared three feet from the crown on the uphill side, and in another, two feet from the crown in a lateral direction. The sprout from the second bush was also two feet from the crown in a lateral direction. A few seedlings were noticed on this area under large bushes.

Area 3. Located four miles south of Sauk City on Mr. King's ranch. One large bush on a sandy hillside had several sprouts four to five feet from the crown on the uphill side of the bush. Numerous seedlings were noted under several of the bushes. The bushes in all three areas had been salted in 1931. It was noted that oak trees were very little affected by the salt even though it was piled next to the trunk. Only that part of juniper, hazel brush and red cedar in direct contact with the salt had been killed. Poplar proved to be somewhat sensitive and, if much salt had been placed under a tree, death usually resulted. Birch appeared to be even more susceptible than the poplar. Cherry was only moderately susceptible. In general, the soil six to eight inches beyond the outer rim of the salt pile appeared to be partially sterile. Catnip, black nightshade, and foxtail were occasionally found growing within such partially sterile areas.

Area 4. Located west of Black Earth, on Mr. Deneen's ranch. This area was salted in 1930. The soil was clay loam in texture. In some instances, treatment had completely sterilized the soil close to the bush while in others small plants of dandelion, smartweed, and catnip were growing close to the crown.

Area 5. Located in the vicinity of Black Earth. This area, characterized by a limestone outcropping, had been salted in 1938. The bushes were of medium size. Blue grass and clover were just beginning to enter the sterile zone of the salted area. No sprouting bushes were found in this area.

Area 6. Located in the vicinity of Peculiar, Wisconsin. This location was of particular interest as the barberry bushes in the area were known to have received excessive amounts of salt. But even here the spots that had been covered with salt were growing some clover, dandelion, catnip, and mullein. No surviving bushes were noted.

Area 7. Located on Richards Farm near Spring Green. Seedlings were coming up thickly under the larger bushes even in the soil next to the crown. Catnip and other weeds were intermingled with the barberry seedlings. There was no evidence of any root sprouts.

In conclusion it is noted that the bushes which had sprouted were invariably found to be large ones growing in more or less sandy soil on hillsides. The sprouts were usually found two to six feet in a lateral position from the crown, or on the uphill side of the bush.

M. Suggestions for Additional Field Experiments

The toxicity of ammonium thiocyanate should be definitely established for barberry plants according to the following technic: (1) as a mixture with sawdust or wheat chaff applied to the soil immediately adjacent to the crown; (2) as a supersaturated aqueous solution applied in the same manner as (1); and (3) as a saturated solution applied as a subsurface application by means of a prod rod. Dosage for the several methods just described should be established.

Tests of ethylene oxide made at Pennsylvania Furnace in 1932 showed this chemical to be fully effective under certain soil conditions. Use of the chemical appears to be limited to those areas where a prod rod can be readily plunged into the soil. The soil, furthermore, should not be so sandy as to allow rapid diffusion of the gas. The dosage of ethylene oxide should be definitely established for favorable sites and the scope of the method more accurately defined.

Further experiments should be made with strong solutions of sodium chlorate applied to the ground about the base of the plant. Applications at Pennsylvania Furnace in 1931 gave such favorable results that further experiments should be planned. The method should be modified, however, to eliminate the fire hazard and the danger to stock by injecting the chemical by means of a prod rod into mineral soil in a series of closely placed holes within an area of two to six inches from the crown. The solution should be as concentrated as possible to reduce to a minimum the amount of water used.

Final experiments with the tubulation method should be made to determine the lethal dosage of sodium chlorate or copper complex to barberry plants of various sizes.

N. Tentative Recommendations for Field Use

Recommendations for field use have been given in Part III of the annual report for this project, but for the sake of completeness they are herein repeated.

In conclusion it is noted that the bushes which had sprouted were invariably found to be large ones growing in more or less sandy soil on hillsides. The sprouts were usually found two to six feet in a lateral position from the crown, or on the uphill side of the bush.

6. Suggestions for Additional Field Experiments

The toxicity of ammonium thiocyanate should be definitely established for barberry plants according to the following technic: (1) as a mixture with sawdust or wood chaff applied to the soil immediately adjacent to the crown; (2) as a concentrated aqueous solution applied in the same manner as (1); and (3) as a saturated solution applied as a subsurface application by means of a prod rod. Dosages for the several methods just described should be established.

Tests of ethylene oxide made at Pennsylvania Furnace in 1930 showed this chemical to be fully effective under certain soil conditions. Use of the chemical appears to be limited to those areas where a prod rod can be readily plunged into the soil. The soil, furthermore, should not be so sandy as to allow rapid diffusion of the gas. The dosage of ethylene oxide should be definitely established for favorable sites and the scope of the method more accurately defined.

Further experiments should be made with strong solutions of sodium chlorate applied in the trench about the base of the plant. Applications at Pennsylvania Furnace in 1931 gave such favorable results that further experiments should be planned. The method should be modified, however, to eliminate the fire hazard and the danger to stock by injecting the chemical by means of a prod rod into mineral soil in a series of closely placed holes within an area of two to six inches from the crown. The solution should be as concentrated as possible to reduce to a minimum the amount of water used.

Final experiments with the tubulation method should be made to determine the lethal dosage of sodium chlorate or copper sulphate to barberry plants of various sizes.

7. Tentative Recommendations for Field Use

Recommendations for field use have been given in Part III of the annual report for this project, but for the sake of completeness they are herein repeated.

Berberis vulgaris: Of the chemicals that have been tested by cooperative experiments of the Divisions of Barberry Eradication and Blister Rust Control, sodium chlorate is the only one that can at present be recommended for field use. To date it is the one chemical that has been definitely proved by field tests to be fully effective on barberry. Ammonium thiocyanate in quantities about 50 per cent more than sodium chlorate may prove to be an effective substitute but cannot be recommended for general field use until its toxicity is confirmed by further experimental tests.

For the eradication of numerous seedlings and small bushes (less than 10 feet of live stem), this project advises spraying with one pound sodium chlorate at the rate of 0.4 to 0.6 pounds of chlorate per 100 feet of live stem. Large bushes should be treated by soil application of saturated aqueous sodium at the rate of 0.2 to 0.4 pounds per 100 feet of live stem after the removal of duff and all surface litter. The latter scheme of eradication appears to have some economic advantages over salting for numerous large bushes. The destruction of single bushes in parks or private estates can be accomplished by cutting off the bush close to the ground and subsequently applying sodium chlorate or sodium fluoride directly to the scarified crown. The dry chemical should be sprinkled evenly over the wetted surface of the crown and all available roots. One-half pound or less of the chemical, depending on the size of the bush, should be sufficient to ensure death.

The above chemical methods may be considered as having been sufficiently demonstrated on an experimental scale to merit field trial in different localities on a more or less controlled basis of large-scale test. That effective results can be expected from the use of these methods is certain; that such methods will be cheaper than the present salting plan can only be determined by comparing their costs with those of salting in a series of field tests performed over a period of years.

PART III

THE STATUS OF INVESTIGATIVE WORK IN THE CHEMICAL ERADICATION OF RIBES AND BARBERRY AND RECOMMENDATIONS FOR FIELD USE

By
H. R. Offord
Agent

Part III of the annual report for project 2.3-1 discusses the status of investigative work in the chemical eradication of Ribes and barberry and describes the limitations of chemical work for important Ribes species and for common barberry. It is intended to serve both as a general statement of the major objectives now under investigation, and as a summary report in which all field and laboratory data are brought up to date in the form of field recommendations.

THE STATUS OF INVESTIGATIVE WORK

In the light of the present situation of uncertain finances, it seems ill-advised to embark on any research program of a fundamental nature unless such work has an immediate and practical application to our control program; therefore, the investigations to be undertaken this winter will be focussed rather sharply on problems of an immediate field nature. Information of a fundamental nature having a bearing on the destruction of plants by chemical means will be sought for in the literature of the subject rather than by direct investigations of such problems in our own laboratory. It might also be stated that this sharp delimitation of objectives is advisable at the present time, regardless of the question of finances since the writer is anxious to make a careful analysis of all past work before recommending the line of future attack.

In keeping with the above-mentioned change in the type of laboratory work, a number of changes are contemplated in the manner of reporting on experimental work. In future, a complete file on laboratory investigations undertaken by this project should contain the following information:

1. A Report on the Status of Project Investigations.

   This paper should include a concise statement of the project objectives, a short resume of previous work, and a brief outline of the proposed work for each objective. Such information should properly appear in the annual report.

2. A Detailed Report on Results of Investigations for Each Objective.

   A standard form has been drawn up for the compilation and presentation of all data pertinent to the details of each

experiment. Detailed reports on laboratory experiments prepared according to this standard form will include a brief description of: title, introduction, procedure, materials, equipment, progress of experiment, summary of results, discussion, and recommendations for future work. These reports will appear as separates from time to time.

It is hoped that these changes in the manner of reporting on experimental work will more definitely line up the needs of the going field operation with laboratory work undertaken by the chemical investigations project.

The status of investigative work is discussed under the following divisions: (1) Ribes eradication, chemical; (2) barberry eradication, chemical; and (3) Ribes and barberry morphology. For purposes of presentation, a brief summary of previous work and a general statement of proposed work is appended to each objective under the three main divisions of work. It might be noted that the present resume recapitulates some of the data which have already been furnished relative to work plans for the coming winter.

RIBES ERADICATION, CHEMICAL

OBJECTIVE 1

Establishment of the minimum dosage of sodium chlorate for 100 per cent eradication of R. inerme and R. lacustre when applied (a) as a soil drench, (b) as a combination aerial spray and soil drench. This dosage to be established for the ecological forms of R. inerme and R. lacustre.

Previous work: Field and laboratory work to date have shown the impracticability of an aerial spray for chemical destruction of most Ribes; but a high per cent kill of bushes has usually been obtained either by application of chemical to soil immediately adjacent to the crown of the plant or by applying chemical to aerial parts plus a liberal application to the soil; in this regard the problem of minimum dosage is of paramount importance. It was first made a major objective of field experiment at Blewett Pass, Washington during the season of 1931. Experience of 1932 showed that it will be necessary to establish a minimum dosage figure for the different ecological forms of Ribes. Laboratory work of 1931 studied the rate of fixation and alteration of sodium chlorate and ammonium thiocyanate by forest soils and demonstrated that both chemicals were excellent soil poisons; of the two sodium chlorate appeared to be a more efficient poison per dollar expended though more hazardous to handle. Experience and observation of the past field season have brought up the point that, regardless of the quantity of chemical finally added to each unit area

experiment. Detailed reports on laboratory experiments prepared according to this standard form will include a brief description of: title, introduction, procedure, materials, equipment, progress of experiment, summary of results, discussion, and recommendations for future work. These reports will appear as separates from time to time.

It is hoped that these changes in the manner of reporting on experimental work will more definitely line up the needs of the field operation with laboratory work undertaken by the several investigations project.

The status of investigative work is discussed under the following divisions: (1) Weed eradication, chemical; (2) [illegible] chemical; and (3) [illegible] morphology. For purposes of presentation, a brief summary of previous work and a general statement of proposed work is appended to each objective under the three main divisions of work. It might be noted that the present [illegible] of the data which have already been furnished relative to work plans for the coming winter.

WEED ERADICATION, CHEMICAL

OBJECTIVE I

Establishment of the minimum dosage of sodium chlorate for 100 per cent eradication of E. inermis and E. lacustre when applied (a) as a soil drench, (b) as a combination aerial spray and soil drench. This dosage is to be established for the ecological forms of E. [illegible] and E. lacustre.

Previous work: Field and laboratory work to date have shown the impracticability of an aerial spray for chemical destruction of weed roots; a high per cent kill of [illegible] has usually been obtained either by application of chemical to soil immediately adjacent to the crown of the plant or by applying chemical in aerial spray plus a liberal application to the soil; in this regard the problem of minimum dosage is of paramount importance. It was first made a major objective of field experiments at [illegible] Farm, Washington during the season of 1932. Experiments of 1932 showed that it will be necessary to establish a minimum dosage figure for the different ecological forms of [illegible]. Laboratory work of 1932 studied the rate of fixation and adsorption of sodium chlorate and ammonium thiocyanate by various soils and demonstrated that both chemicals were excellent soil poisons; of the two sodium chlorate appeared to be a more efficient poison and longer enduring though more dangerous to handle. Experience and observation of the past field season have brought up the point that, regardless of the quantity of chemical finally added to each unit area

of soil surface, the chemical as it is applied must not be below a certain minimum concentration. It seemed desirable to study further the question of minimum dosage with reference to the factor of concentration when a chemical is used as a soil drench.

Proposed work: To apply sodium chlorate in such quantities to soil of an approximately optimum moisture content for Ribes growth that resultant concentrations of 1/4, 1/2 and 4/5 of one per cent in the soil solution will be attained. These quantities of sodium chlorate are approximately equivalent to dosages of 2,500, 5,250 and 8,000 pounds per acre respectively. With a known volume of soil in each pot, the dosage will thereby be known in terms of weight of chemical per unit volume of soil and concentration of sodium chlorate in per cent or parts per million in the soil solution. The aqueous chlorate solution will be distributed evenly over the soil in which the potted plants are growing and the pots subsequently maintained at optimum moisture content by frequent weighing and addition of water. *R. roezli* growing on Stanislaus Forest soil will be used as experimental material with extension to *R. inerme* when that material is ready. If time and material permit, an extension of this experiment will be made to include application of the chemical as a combination aerial spray and soil drench.

OBJECTIVE 2

Search for and adequate greenhouse and field testing of new killing agents for more effective use as under Objective 1. These chemicals to be compared with sodium chlorate as to cost and effectiveness.

Previous work: On the basis of the chemical properties of various classes of chemical substances, such as inorganic and organic acids and bases, complex salts of heavy metals, inorganic and organic salts, inorganic and organic oxidizing and reducing compounds, oils and gases, over one thousand formulae have been tested by field and greenhouse application to Ribes. Over 95 per cent of these formulae were tested as sprays, and considerable time was spent synthesizing compounds which by virtue of their chemical properties and by virtue of our knowledge of the chemical composition of the various Ribes species, were designed as specific poisons. In the selection or synthesis of these poisons for spray application, a premise postulated early in the course of projected investigations was kept in mind. This premise suggested that the most effective toxic agents would be found among those chemical compounds having concealed elements of toxicity so that an immediate caustic or blasting action on foliage would not occur. While subsequent field and laboratory experiments bore out the validity of this premise, an ever-increasing volume of data indicated the impracticability of chemical destruction of stream type Ribes (except *R. petiolare*) by single application of any chemical to aerial parts alone. Recent studies of the gross morphology of Ribes have shown even more clearly the limitations of the spraying method in so far as 100 per cent

of soil surface, the chemical as it is applied must not be below a certain minimum concentration. It seemed desirable to study further the question of minimum dosage with reference to the factor of concentration when a chemical is used as a soil drench.

Proposed work: To apply sodium chlorate in such quantities to soil of an approximately optimum moisture content for Ribes growth that resultant concentrations of 1/4, 1/2 and 3/4 of one per cent in the soil solution will be attained. These quantities of sodium chlorate are approximately equivalent to dosages of 2,500, 4,500 and 6,000 pounds per acre respectively. With a known volume of soil in each pot, the dosage will thereby be known in terms of weight of chemical per unit volume of soil and concentration of sodium chlorate in per cent or parts per million in the soil solution. The aqueous chlorate solution will be distributed evenly over the soil in which the potted plants are growing and the pots subsequently maintained at optimum moisture content by frequent weighing and addition of water. R. roezli growing on Stanislaus forest soil will be used as experimental material with extension to R. lacustre when that material is ready. If time and material permit, an extension of this experiment will be made to include application of the chemical as a combination aerial spray and soil drench.

OBJECTIVE 2

Search for and adequate greenhouse and field testing of new killing agents for more effective use as under Objective 1. These chemicals to be compared with sodium chlorate as to cost and effectiveness.

Previous work: On the basis of the chemical properties of various classes of chemical substances, such as inorganic and organic acids and bases, complex salts of heavy metals, inorganic and organic salts, inorganic and organic oxidizing and reducing compounds, oils and gases, over one thousand formulas have been tested by field and greenhouse application to Ribes. Over 90 per cent of these formulas were tested as sprays, and considerable time was spent synthesizing compounds which by virtue of their chemical properties and by virtue of our knowledge of the chemical composition of the various Ribes species, were designed as specific poisons. In the selection or synthesis of these poisons for spray application, a premise postulated early in the course of eradication investigations was kept in mind. This premise suggests that the most effective Ribes-killing agents would be found among those chemical compounds having combined elements of toxicity so that an immediate caustic or blasting action on foliage would not occur. While subsequent field and laboratory experiments bore out the validity of this premise, an ever-increasing volume of data indicated the impracticability of chemical destruction of certain type Ribes (except R. petiolare) by single application of any chemical to aerial parts alone. Recent studies of the gross morphology of Ribes have shown even more clearly the limitations of the spraying method in so far as 100 per cent

kill of treated plants is concerned. This project is now attempting to select a satisfactory soil poison to be used either as a soil drench alone or as a combination soil drench and aerial spray in the eradication of *R. inerme*.

The application of chemicals as soil poisons was a minor part of the chemical investigations program from the inception of the work in the West in 1924 until 1930. Commencing with the field season of 1930, the question of soil poisons has been examined by both field and laboratory methods. The results of experiments with soil poisons have been presented in annual reports (1924-1931) under synonyms of crown application, root application, soil application, soil drench, and subsurface drench. The most promising chemicals that have been reported under these headings are: sodium chlorate, alkaline sodium fluoride, sodium arsenite, ammonium chloride, copper complex, zinc ammonium chloride, ammonium thiocyanate, sodium dichromate, Diesel oil, and petroleum sludge-oil.

In choosing a soil poison a lengthy list of possible toxic agents is greatly shortened by considerations of low cost, availability, ease of handling, and safety. A successful soil poison must combine the aforementioned features with desirable toxic properties. Among the latter should be noted resistance to alteration and fixation by the soil and injuriousness to plant in moderate quantities.

Proposed work: Under this topic the literature will be thoroughly explored and all information which can be obtained from allied investigators will be kept on file. Chemical compounds which are suggested through this work either directly or indirectly will be given adequate greenhouse test and a new compound appearing to have possibilities for field use will be given a field test on wild Ribes growing in the vicinity of Berkeley.

OBJECTIVE :

Establishment by field test of the effectiveness of applying aqueous sodium chlorate (one pound per gallon) to stems and roots of *R. petiolare* as against effectiveness of complete coverage.

Previous work: As early as 1926 it was shown that *R. petiolare* could be successfully eradicated by one application of aqueous sodium chlorate to the stems and leaves of the plant. During succeeding years, the concentration of sodium chlorate in aqueous solution has been reduced from 25 per cent to 10 per cent with satisfactory results. It has been determined that complete coverage of aerial parts with sodium chlorate in aqueous solution as low as 5 per cent will give 100 per cent results if applied early or mid-season in localities where the water table is not too high. In 1931, to avoid misinterpretation of local conditions on the part of crew foremen, it was recommended that 10 per cent sodium chlorate be used to effect complete coverage of aerial parts and that additional chemical be squirted on the ground near the base of the plant. This instruction was issued subsequent to the compilation of field data which

suggested that considerable killing action resulted from the chemical that found its way to the ground. It is now suggested that treatment of R. *petiolare* may be just as effective if the chemical is applied directly to the ground with coverage of the basal portions of the stems. It is not expected that any appreciable saving of chemical can be made by substituting this method for the old one of complete coverage but it is quite likely that a saving in the spraying time of the crew may be realized.

Proposed work: A series of experiments is planned in which R. *petiolare*, carefully protected so that no contamination of the soil by the chemical is possible, will be dipped in solutions of sodium chlorate. Subsequent examination and analysis of plant parts will be made in order to note the extent of the aerial toxic action. Objective 3 will also be made the subject of a careful field experiment next year.

OBJECTIVE 4

Consideration of the application of small quantities of chemical to scarified crowns as a possible chemical means for the eradication of R. *viscosissimum*, R. *roezli*, R. *irriguum*, and other Ribes of the individual bush type. With the increasing importance of upland Ribes eradication the problem of R. *viscosissimum* should be given more attention.

Previous work: Methods of destroying Ribes by stem injection, tubulation, and crown scarification, were not tested by this project until 1930 when they were designed primarily as follow-up methods for the eradication of stream type Ribes and as possible general methods for upland Ribes. Special tools were constructed by Van Atta and Breakey for injecting into slit stems of Ribes a toxic chemical in the form of a glycerine paste. Methods of stem injection have proved to be unsatisfactory both on the grounds of poor kill and impracticability of the method itself. Tubulation has been used largely as a means of studying the uptake and movement of dyes and heavy metal complexes rather than as a field method for destroying Ribes. Of the methods used, mechanical injury of the crown with subsequent application of chemical to scarified crown tissue has shown best results. Of the various chemicals tested by application to scarified crowns, the following have proved to be most effective: copper complex, sodium chlorate, Diesel oil, sodium arsenite, and cadmium chloride. Experience gained in 1930-1931 field experiments showed that although Ribes such as R. *inerme* which possess intricate underground systems could not be successfully attacked by this method, Ribes having a single well developed central crown might be satisfactorily destroyed. Diesel oil has proved to be a satisfactory killing agent for R. roezli in dry locations if applied as a soil drench or as a combination spray and soil drench at the rate of one to two pints per bush.

Proposed work: A compilation will be made by Van Atta of all field and laboratory data which are available from his tubulation experiments. Some 216 samples of plant material are now being analyzed for copper content.

A final report on this problem will be presented later in the year. In regard to the eradication of *R. viscosissimum*, it is believed that considerable help might be secured from a method of crown scarification after cutting off or injuring the tops of the plants, with subsequent application of concentrated solution or dry crystals of sodium chlorate, sodium fluoride, Diesel oil, or copper sulphate to the scarified crown. Sufficient laboratory and field tests of this method will be made this winter so that definite recommendation as to chemical and quantity of chemical can be made before starting next year's field work. This method is suggested for crew use as an auxiliary method to that of hand eradication when stuchora Ribes are encountered and as such might be considered for *R. roezli*, *R. irriguum*, and perhaps *R. bracteosum*.

OBJECTIVE 5

Application of findings on Idaho *R. inerme* to *R. inerme* problem which exists in northern sugar pine forests of California.

Previous work: Owing to the fact that *R. inerme* is often intimately associated with *R. petiolare* in north Idaho stream type, the early success of the spraying method on *R. petiolare* directed the attention of project investigations to the development of a similar method for *R. inerme*. From 1924 to 1929 sufficient chemicals were tested by spray application to the aerial parts of *R. inerme* in Idaho and California to show the impracticability of that method. From 1930 to the present date investigations have been made of methods of soil poisoning, injection into aerial and injuring stems, application to scarified crowns, dusting and tubulation. Of these methods, soil poisoning had proved to be the only method capable of general application. Considerable data have been obtained on the gross morphology of *R. inerme* as related to application of the chemical and minimum dosage of chemical needed for 100 per cent kill. Progress has been made in the development of crew methods for applying chemical in a broadcast manner to the soil. All of these studies have combined to show the necessity of recognizing two or more ecological forms of *R. inerme*. Dosage of sodium chlorate necessary for 100 per cent kill of the various ecological forms may vary from 350 pounds per acre for the shallow-rooted, sand-bar type to 1,200 pounds per acre for the deep-rooted bench type. (350 pounds per acre selective application is about equivalent to 5,000 pounds per acre for even distribution and calculated on the same basis, 1,200 pounds would be equal to about 17,000 pounds.) Mechanical methods for the eradication of *R. inerme* are strongly indicated.

Proposed work: Data obtained from the studies on gross morphology of roots of the ecological forms of *R. inerme* undertaken during the summer of 1932 in Idaho will be applied to the problem of *R. inerme* in California. It is also believed that assistance will be furnished from the data available from McChade Camp experiments and from the methods of mechanical eradication now being studied by Johnson.

A final report on this problem will be presented later in the year. In regard to the eradication of E. [illegible], it is believed that con-siderable help might be secured from a method of close scarification of or cutting off or injuring the tops of the plants, with subsequent application of concentrated solution or dry crystals of sodium chlorate, sodium fluoride, diesel oil, or higher solvents to the scarified crown. Sufficient laboratory and field tests of this method will be made this winter so that definite recommendations as to chemical and quantity of chemical can be made before starting next year's field work. This method is suggested for crew use as an auxiliary method to that of hand eradication when stubborn plants are encountered and as such might be considered for E. [illegible], E. [illegible], and perhaps E. [illegible].

PROJECT [illegible]

Application of findings on Johnson grass to E. [illegible] problem which exists in northern sugar beet fields of California.

Previous work: Owing to the fact that E. inerme is often intimately associated with E. latifolia in marsh lands of some type, the early success of the spraying method on E. latifolia stressed the extension of project investigations to the development of a similar method for E. inerme. From 1934 to 1936 sufficient chemicals were tested by spray application to the aerial parts of E. inerme in Idaho and California to show the impracticability of that method. From 1936 to the present date investigations have been made of methods of soil poisoning, injection into aerial and lay-ring stems, application to scarified crowns, seeding and cultivation. Of these methods, soil poisoning and crowd seem to be the only method capable of general application. Considerable data have been obtained on the gross morphology of E. inerme as related to application of the chemical and minimum dosage of chemical needed for 100 per cent kill. Progress has been made in the development of crew methods for applying chemical in a broadcast manner to the soil. All of these studies have combined to show the necessity of recognizing two or more ecological forms of E. inerme. Dosage of sodium chlorate necessary for 100 per cent kill of the various ecological forms may vary from 250 pounds per acre for the shallow-rooted, sandier type to 1,300 pounds per acre for the deep-rooted heavy type. (250 pounds per acre selective application is about equivalent to 8,000 pounds per acre for even distribution and calculated on the same basis, 1,300 pounds would be equal to about 17,000 pounds.) Mechanical methods for the eradication of E. inerme are strongly indicated.

Proposed work: Data obtained from the studies on growth morphology of roots of the ecological forms of E. inerme undertaken during the summer of 1937 in Idaho will be applied to the problem of E. inerme in California. It is also believed that assistance will be furnished from the data available from the Idaho [illegible] experiments and from the methods of mechanical eradication now being studied by Johnson.

OBJECTIVE 6

Consideration of hand pulling, crown scarification and application of toxic agents to injured crown for eradication of R. bracteosum.

Previous work: Experiments on the chemical eradication of R. bracteosum were started in 1928 and continued during field seasons of 1929 and 1930. Work dealt chiefly with the spray application of chlorates and copper complex. Results showed that the effectiveness of sprays varied considerably with the ecological forms encountered and furthermore that chlorates were definitely superior to copper complex for all ecological forms of R. bracteosum. For plants growing in moist, shady locations adjacent to sloughs, a live-stem kill of 96 per cent and a bush kill of 65 per cent represent results which can be expected from sodium chlorate 1.4 pounds per gallon. The same concentration of chemical killed 95 per cent and 25 per cent live stem and bushes, respectively, where the plants were growing in exposed locations in soft, mossy ground. Poorest results were obtained on R. bracteosum where plants grew along the margin of a stream deeply rooted in a light soil containing many granite boulders, windfall and superfluous surface material. Under these conditions the live-stem kill seldom exceeded 90 per cent and bush kill varied between zero and 10 per cent. For the shade-slough form of R. bracteosum, satisfactory results might be achieved by increasing the dosage of sodium chlorate.

Proposed work: This particular problem is also a problem for further field experimentation rather than laboratory work at the present time. For R. bracteosum having composite crowns greatest hope for economic destruction seems to lie in the direction of mechanical injury to the plant with subsequent application of chemical to the crown.

OBJECTIVE 7

Completion of tests on the fire-resistant properties of trouser material which has been in actual use to note the permanency of the fire-proofing and water-proofing treatment after the cloth has been subjected to normal field wear and repeated laundering. Search for a binder of stannic oxide which will prove more permanent than Halowax.

Previous work: The need of affording protection to men engaged in handling chlorates was recognized as early as 1926. A heavy coat of asphaltum paint was used to coat trouser legs of clothing worn by the chemical investigations crew in 1927. This test showed the need of combining a fireproofing agent with a water-proofing substance. In 1928 the old Perkins' processing for "tinning" cloth was combined with gilsonite as a water-proofing agent to produce a cloth which was quite safe from the standpoint of rapid propagation of flame following ignition of chlorate-soaked specimens of the cloth. In 1930, the water-proofing and binding agent, gilsonite, was replaced by Halowax, a commercial flame-proof wax. This combination resulted in a cloth which was reasonably soft, durable,

and free from any immediate discomforting effects on the wearer. Recent tests of trousers manufactured from this cloth show that some skin irritation results from a protracted wearing of the pants.

Proposed work: Samples of the worn and washed trouser material will be tested--

(a) as they now are,
(b) after soaking in 10 per cent sodium chlorate for one hour,

for fireproof qualities with respect to ignition by:

(a) spark produced by glowing wood splinter,
(b) striking of a match by rubbing vigorously on cloth,
(c) open flame of match.

Preliminary reports by those persons who wore fireproofed trousers during last field season indicate that the Halowax compound now used to form a protective water-proof coat over the tin impregnated fibre is not protecting the wearer from skin irritation by the finely divided tin oxide. Synthetic resins have been suggested by Van Atta as a possible improvement over the Halowax and will be made the subject of laboratory investigation. When all tests have been completed, a final recommendation will be made to the office covering cost, practicability, and advantages to be secured by treating trousers and all canvas material used in handling chlorates.

BARBERRY ERADICATION, CHEMICAL

OBJECTIVE 8

Establishment of the minimum dosage of sodium chlorate and ammonium thiocyanate per unit area of ground surface for 100 per cent kill of barberry when applied in aqueous solution to the soil; and establishment at the same time of this minimum dosage with respect to the distribution of barberry canes comprising the bush treated and the total area over which this minimum dosage must be applied to ensure complete kill.

Previous work: Field experiments of 1930 to 1932 inclusive have shown that, although barberry can be successfully killed by spraying of the aerial plant parts with sodium chlorate, application of a chemical in solid or concentrated aqueous solution to the ground immediately adjacent to the crown or crowns of a barberry bush is the most effective way of accomplishing chemical kill. Sodium chlorate and ammonium thiocyanate have proved to be the most effective chemicals when applied to the soil, and the latter, in view of the hazards of sodium chlorate, offers best possibilities for a general method of chemical eradication. Field tests have shown that, applied as a spray, 0.4 pound per 100 feet of live stem for sodium chlorate or 0.6 pound per 100 feet of live stem for ammonium thiocyanate is sufficient to cause death of the plants. Tests at Pennsylvania Furnace in 1931 and 1932 showed that, applied as a soil drench, sodium chlorate 0.22 pound or ammonium thiocyanate 0.45 pound per 100 feet of live stem will kill barberry plants. This question of minimum dosage

and free from any immediate discomforting effects on the wearer. Recent tests of fireproofed manufactures from this cloth show that the skin irritation results from a protracted wearing of the pants.

Proposed tests. Samples of the mixed and washed fireproof material will be tested--

(a) as they now are.
(b) after soaking in 10 per cent sodium chlorate for one hour.

for fireproof qualities with respect to ignition by

(a) sparks produced by flaming wood splinters.
(b) striking of a match by rubbing rapidly on cloth.
(c) open flame of match.

Preliminary reports by those persons who wore fireproofed trousers during last field season indicate that the Halowax compound was used to form a protective water-proof coat over the impregnated fibers is not protecting the wearer from skin irritation by the finely divided crystals. Synthetic resins have been suggested by the office as a possible improvement over the Halowax and will be made the subject of laboratory investigation. When all tests have been completed, a final recommendation will be made to the office regarding cost, practicability, and advantages to be secured by treating trousers and all woven material used in handling chlorates.

BARBERRY ERADICATION, GENERAL

CHEMICALS A

Establishment of the minimum dosage of sodium chlorate and ammonium thiocyanate per unit area of ground surface (i.e. 100 feet) that will kill of barberry when applied in aqueous solution to the soil, and establishment at the same time of this minimum dosage with respect to the distribution of barberry roots underground; the bush treated and the total area over which this minimum dosage must be applied to ensure complete kill.

Previous work. Field experiments of 1930 to 1936 inclusive have shown that, although barberry can be successfully killed by spraying of the aerial plant parts with sodium chlorate, application of a chemical in solid or concentrated aqueous solution to the ground immediately adjacent to the crown or crowns of a barberry bush is the most effective way of accomplishing chemical kill. Sodium chlorate and ammonium thiocyanate have proved to be the most effective chemicals when applied to the soil, and the latter, in view of the hazards of sodium chlorate, offers best possibilities for a general method of chemical eradication. Field tests have shown that, applied as a spray, 0.4 pound per 100 feet of live stem for sodium chlorate or 0.6 pound per 100 feet of live stem for ammonium thiocyanate is sufficient to cause death of the plants. Tests at Pennsylvania Furnace in 1935 and 1937 showed that, applied as a soil drench, sodium chlorate 0.22 pound or ammonium thiocyanate 0.46 pound per 100 feet of live stem will kill barberry plants. This question of minimum dosage

should be made the subject of additional laboratory investigations.

Proposed work: Barberry plants growing on Pennsylvania and Wisconsin soil will be treated with three concentrations of sodium chlorate and ammonium thiocyanate. The aqueous solutions will be applied evenly to the soil over varying areas of soil surface. Pots will be maintained at a constant moisture content. Complete records will be taken of the progress of kill.

OBJECTIVE 9

Establishment of the value of a solid dilutent for use with ammonium thiocyanate and comparison of that dilutent with water as a medium of distribution.

Previous work: In the application of solid ammonium thiocyanate about the base of a barberry plant, it was found that the tendency of the thiocyanate to cake and form lumps militated against an even distribution of the chemical. To overcome this difficulty the thiocyanate was mixed with varying quantities of sand or sawdust before application. Results of these preliminary field tests strongly indicate further investigations of solid dilutents for use with ammonium thiocyanate. It was further noted that the killing action of this chemical did not extend very far into the roots from the point of contact, thus suggesting the desirability of more uniform coverage of the soil immediately superadjacent to the roots.

Proposed work: Varying quantities of sawdust, sand, powdered chalk, sulphur, Fullers' earth and wheat chaff will be mixed with ammonium thiocyanate and spread evenly over the soil surface adjacent to barberry plants. Results of work under Objective 8 will be kept in mind throughout the course of the experiment. Examination of the mixture will be subsequently made to determine the amount of ammonium thiocyanate fixed or absorbed by the dilutent. Pots will be maintained at moisture content closely approximating that of field soils.

OBJECTIVE 10

Search for and test of new killing agents by greenhouse application.

Previous work: On the basis of field experience in the chemical eradication of Ribes, tests were made of 172 chemical formulae designed for the chemical destruction of barberry by several methods of application. Of these spray formulae 69 were tested as sprays, 55 as soil poisons, and 48 as direct poisons applied to scarified crown, root, or stem tissue. Sodium chlorate, ammonium thiocyanate, Diesel oil, and sodium dichromate were the most effective sprays; sodium chlorate, ammonium thiocyanate, Diesel oil, zinc ammonium chloride, sodium fluoride, and copper complex were

among the most effective soil poisons; copper complex and sodium chlorate are noted as being most effective for tubulation; for direct poisoning, i.e., application to scarified or mechanically injured crowns and roots, sodium chlorate, copper complex, ammonium thiocyanate, cadmium chloride, and sodium fluoride have proved to be most toxic.

Proposed work: Under this topic the literature will be thoroughly explored and all information which can be obtained from allied investigators will be kept on file. New chemical compounds which are suggested through the work either directly or indirectly will be given adequate greenhouse test. Attention should be paid to compounds of cadmium and to the fluorides.

OBJECTIVE 11

Comparison of aqueous solutions of sodium chloride, zinc ammonium chloride, and ammonium chloride with sodium chlorate and ammonium thiocyanate on a basis of minimum dosage and most effective distribution as to area of ground surface.

Previous work: Experiments in the chemical eradication of both Ribes and barberry have shown ammonium compounds to be satisfactory soil poisons. Since most of the ammonium compounds can be considered as relatively nontoxic to animals they represent desirable compounds to use in the field. For this reason it is desirable to extend field experiments to the laboratory for further evaluation of ammonium compounds as soil poisons.

Proposed work: Subsequent to completion of work outlined under Objective 8, the above-mentioned chemicals and others as derived from the work under Objective 10 will be applied in aqueous solution to potted barberry plants growing on Moscow soil. The same procedure as outlined by Objective 8 will be used to study the effect of chemical as related to the killing power of a definite amount of chemical.

OBJECTIVE 12

Comparison of the viability of barberry seeds collected from untreated plants with seeds collected from plants treated with sodium chlorate and ammonium thiocyanate.

Previous work: The possibility of using sodium chlorate or ammonium thiocyanate in a large-scale field method for the chemical eradication of barberry has suggested an inquiry into the effect of these chemicals on the viability of barberry seeds. No previous work has been undertaken on this subject.

Proposed work: Germination experiments will be carried out on the above seeds according to the technic which has been employed at Moscow for germinating barberry seeds. If time and material permit, the temperature control chambers belonging to the blister rust ecology project will be used to effect diurnal variation of temperature.

OBJECTIVE 13

Establishment of a more definite measure for the application of common salt on the basis of (a) size of crown as given by distribution of canes, (b) height of bush and feet of live stem, (c) type of soil, and (d) topographical factors.

Previous work: Although careful experiments have been made in past years on this particular objective, it seems desirable in the light of later experience and more data to make a careful analysis of the going field methods with particular reference to the quantity of salt applied per bush. Before recommending that sodium chlorate or ammonium thiocyanate be used in place of common salt, accurate data must be obtained relative to minimum dosage for each of these chemicals. Common salt being very low in the scale of absolute toxicity must of necessity be used in amounts showing considerable variation; and, whereas the quantity of common salt applied per bush might vary from two pounds to a hundred pounds, the quantity of sodium chlorate or ammonium thiocyanate may only vary between one-half and ten pounds per bush.

Proposed work: The major portion of the work on this topic will comprise a careful tabulation of all extant data. An analysis of these data will be made in such a way that a direct comparison can be made with the quantity of chlorate and thiocyanate needed for complete kill with the idea of evaluating the three chemicals in terms of practicability for field use.

OBJECTIVE 14

Test of the effectiveness of sodium chlorate and copper complex for tubulation work.

Previous work: The need for a method of treating single barberry bushes without damaging adjacent foliage resulted in the so-called tubulation method. In 1930, a number of chemicals were tested according to this method by affixing a short length of rubber tubing to a freshly severed barberry cane. The tube was filled with a concentrated aqueous solution of the chemical to be tested and allowed to remain in contact with the barberry cane until the plant had absorbed as much chemical as it could take. A heavy paraffin paper tube attached to the barberry cane by a shorter length of rubber tubing was used in 1931 and 1932 experiments. Of the chemicals tested, copper complex and sodium chlorate have proved

to be most effective. Results have been somewhat inconsistent and suggest the desirability of determining by field experiment the number of tubes and quantity of poison needed to kill plants of varying sizes.

Proposed work: This objective cannot be made the subject of laboratory and greenhouse experiments owing to a lack of large bushes satisfactory for tubulation. Additional field experiments are planned for next year.

RIBES AND BARBERRY MORPHOLOGY

OBJECTIVE 15

Establishment of relationships existing between physical characteristics, i.e., gross morphology of Ribes and Berberis, and susceptibility to chemical eradication by (a) spraying of aerial parts, (b) soil drenching, (c) injection following scarification of crown or stem, and (d) tubulation.

Previous work: Variation in response to the toxic action of chemicals on the part of different Ribes species was one of the first points to come to the attention of the investigators during the 1926 check. In studying the question of the gross morphology of Ribes particular attention was directed to the aerial parts due to the importance that was attached to the method of spraying. Factors influencing the application of sprays were discussed in the 1926 annual report and recommendations were made for the use of glue as a sticker and spreader. Root morphology was given but little attention during the period 1924 to 1929, a short excursion into that field of investigation in 1926 showing only too well the time and effort that would be needed for adequate investigation. By 1930, however, field experiments were once again concerned with the application of chemicals to the soil for uptake through roots and in 1932 root studies on R. *inerme* and R. *petiolare* were made a major objective of the morphological work. A field method for mapping the root spread and penetration was devised and some 85 R. *inerme* and 27 R. *petiolare* plants were studied according to this established method.

Proposed work:

(a) To summarize concisely the available field data on the root spread and penetration, and the relations between root systems and stem systems, of R. *inerme* and R. *petiolare*. The data concerned were collected during the latter part of the summer of 1932 in north Idaho.

(b) To examine critically the field methods used in the collection of the data of (a) above to determine if all the necessary field data are being obtained efficiently.

(e) To carry on in the vicinity of Berkeley a small scale experimental collection of field data to test any proposed new methods.

OBJECTIVE 16

Division of the genus Ribes and Berberis into groups by combination of these data, Objective 15 above, with ecological data; this will assist in methods experiments designed to reduce costs and promote efficiency.

Previous work: The importance of ecological forms of the various Ribes was not fully appreciated during the early years of chemical investigations. With the expansion of the work into different states in 1929, the importance of ecological variation was suggested by the apparent greater susceptibility to chlorates of R. lacustre in Oregon than R. lacustre in Idaho. During 1931 and 1932, a great deal of confusion was created in the minds of different project workers by the large variations in the quantity of sodium chlorate needed for kill of R. inerme. Aside from the obvious variations which would occur by virtue of the eternal human equation, it was apparent that there existed several ecological forms of R. inerme all of which called for different treatment both as to dosage and manner of application. In planning the work outlined under Objective 16, proper consideration will be given to the ecological forms. In many instances there has been found greater variation between ecological forms than between species. This point might well be considered by investigators in the field of rust pathology.

Proposed work: To compile and express all pertinent data of the above in a manner such that its significance will be accessible and usable to the men engaged in large-scale eradication of Ribes. Emphasis will be placed upon relationships between the studied species and upon comparisons between the various ecological forms of the separate species.

OBJECTIVE 17

Extension of this knowledge to other groups of plants by observations and experiment.

Previous work: Experiments on the chemical eradication of stream type Ribes undertaken at Clarkia, Idaho in 1926 showed that associated plants and shrubs receiving accidental chemical treatment were frequently killed. Grasses and succulent annuals were readily killed by the chlorate sprays as were many of the brush species such as Alnus, Salix and Cornus; Crataegus, Rhamnus, and Prunus were less severely damaged. Of the woody shrubs, Alnus and Salix are most susceptible to the toxic action of chemicals though some variation was noted in the susceptibility of species within the genus. In California, Manzanita and Ceanothus were noticed as being rather susceptible to the killing action of chlorates. Salix sp.,

Alnus tenuifolia and Cornus stolonifera of Idaho and Arctostaphylos patula, Ceanothus cordulatus, Ceanothus integerrimus, and Castanopsis sempervirens of California have been studied and records obtained on stomatal frequency, palisade ratio, and epidermal ratio. In the case of these associated brush species, a greater potential movement through the stems is indicated by a more coarse-textured secondary xylem than in the case of Ribes.

Proposed work: To study as time permits the literature dealing with the forms of root systems and to consider particularly those articles and works dealing with the variations of root systems that may be ascribed to ecological factors.

OBJECTIVE 17

Establishment of relationships between the histology of various ecologic forms and species of Ribes and Berberis as a means of confirming and extending the results of Objectives 15 and 16 above.

Previous work: A systematic and thorough investigation of the histology of Ribes was begun at Berkeley in 1929 by Mrs. I. E. Webber. A special effort was made to determine what anatomical features, if any, were responsible for the wide differences in susceptibility to toxic agents which were exhibited by the various Ribes. Since greatest importance was attached to spraying as a practical method for the destruction of Ribes, the internal and external morphology of leaves and stems were first studied. Although marked differences in the internal morphology of Ribes species were evident it was also certain that variation in anatomical structures, as represented by ecological forms within a species often occurred to such an extent that species differences were not always characteristic or significant. The influence of site upon the histology of Ribes is not without interest and application to ecological and pathological investigations as well as to chemical investigations. For example, it has been noted that with an increase in sun exposure there was an increase in stomata, simple hair, gland frequency, leaf thickness, palisade ratio, frequency of calcium oxalate druses, amount of tannin, development of vascular elements of petiole, size of vessels of secondary xylem of stem and average size of starch grains. With an increasing sun exposure, there was a decrease in size of leaf lamina, length of petiole, and in diameter and length of current-season stems in the case of R. inerme and R. lacustre.

Proposed work:

(a) To work over in as thorough a manner as time and collections permit the available histological materials of R. glandulosum, R. sativum, and R. petraeum that have been received from the East.

(b) To complete, as far as time and collections on hand permit, the study of the ecological variation of the histological anatomy of R. roezli. The leaf, being one of the most important and most variable of plant organs, will receive special attention.

OBJECTIVE 19

Determination of the best method of insuring an adequate supply of robust plants for use in greenhouse experiments with chemicals.

Previous work: Methods of handling of plant material for greenhouse propagation have varied somewhat from year to year and for the most part have been designed as practical methods of propagation. A satisfactory culture solution has been devised for growing seedlings and small plants. Berkeley hills soil, quartz and river sand, Oakley Blow and Stanislaus Forest soil have been used at various times for maintaining a stock of greenhouse plants. Of these soils, Stanislaus Forest soil has proved to be most satisfactory. Seedlings and small plants have been used more extensively than cuttings; the latter with the possible exception of R. petiolare, have not produced vigorous and healthy plants according to past technic. This year it was necessary to obtain R. inerme for greenhouse propagation in the form of cuttings; it will be necessary, therefore, to improve our former methods of handling this sort of plant material.

Proposed work:

(a) To search the literature on the breaking of dormancy of plant parts, particularly cuttings.

(b) To determine the most rapid and satisfactory manner of breaking the dormancy of Ribes stem cuttings by exposure to low temperatures. This would involve the storing of groups of cuttings: (1) out of doors, (2) at 0° C., (3) at 5° C., and (4) at 10° C., for periods of 2, 4, 6, 8, 10, and 12 weeks. If sufficient material be available, R. inerme will be the species experimented upon.

(c) To improve wherever necessary the present method of growing seedlings. The problem of dormancy of seedlings will also be considered.

OBJECTIVE 20

The development of one part of the University of California Botanical Garden into a well ordered and well kept collection of growing plants of representative species of Ribes.

Previous work: In 1930, an agreement was made with the Department of Botany of the University of California whereby one acre of land contiguous to the Botanical Garden in Strawberry Canyon was assigned to this office for the establishment of a Ribes garden. The purpose of this project was to collect and propagate specimens of all known species comprising the genus Ribes. These plants would furnish material for histological examinations as the need arose and would be under continual observation concerning the effect of environment on the various species. During the past two and one-half years 36 species of Ribes have been established in the garden.

Proposed work:

(a) To take all necessary care of the Ribes garden area and the plants therein.

(b) To acquire additional plants, cuttings, and seed samples of Ribes.

OBJECTIVE 21

Continued experimentation upon the germination of Ribes seeds, but only in so far as such experimentation is directly concerned with either the production of exotic plants for the Ribes garden, or the growth of plants for use in the greenhouse experiments with chemicals.

Previous work: Experiments on the germination of Ribes seeds were begun in the fall of 1931 and continued during the spring of 1932. R. roezli seeds have been used as material for germination tests in which these seeds were (1) stored at temperatures of 0, $2\frac{1}{2}$, 6, and 10° C. for varying periods; (2) stored under diurnal variations of 0-6, 0-10, and 6-10° C. for varying periods; and (3) treated with combination of constant temperature storage with germination at alternating temperatures. Early experiments on the survival and growth of seedlings from germinated seeds showed that the subsequent mortality depended a great deal on the initial treatment to which the seeds were subjected. The use of distilled water on seeds during moist aerated refrigeration, absorbent cotton as a water-holding medium for carrying seeds during period of germination, the use of thoroughly washed river sand, and protracted periods of storage at $2\frac{1}{2}$° C., were among the important suggestions of past work.

Proposed work: To determine if the germination response of various species of Ribes seeds can be in any manner correlated with the taxonomic units of the genus. It is proposed to treat cultures of seeds of 40 species of Ribes to each of the following pre-germination stratifications: (1) 5 months at 0° C., (2) 4 months at $2\frac{1}{2}$° C., (3) 5 months at 5° C., and (4) 5 months at 10° C. Cultures of seeds will also receive the following diurnal alternation of temperature treatments: (5) 5 and 25° C. for 5 months, and (6) 10 and 25° C. for 5 months. The six treatments will then be compared as to efficiency in breaking the seed dormancy of the various Ribes species.

Previous work: In 1930, an agreement was made with the Department of Botany of the University of California whereby one acre of land contiguous to the Botanical Garden in Strawberry Canyon was assigned to this office for the establishment of a Ribes garden. The purpose of this project was to collect and propagate specimens of all known species comprising the genus Ribes. These plants would furnish material for histological examinations as the need arose and would be under continual observation concerning the effect of environment on the various species. During the past two and one-half years 26 species of Ribes have been established in the garden.

Proposed work:

(a) To keep all necessary care of the Ribes garden area and the plants thereon.

(b) To acquire additional plants, cuttings, and seed samples of Ribes.

[illegible]

Continued experimentation upon the germination of Ribes seeds, but only in so far as such experimentation is directly concerned with either the production of exotic plants for the Ribes garden, or the growing of plants for use in the greenhouse experiments with chemicals.

Previous work: Experiments on the germination of Ribes seeds were begun in the fall of 1929 and continued during the winter of 1930. R. roezli seeds have been used as material for germination tests in which these seeds were (1) stored at temperatures of 1, 3½, 4, and 10° C. for varying periods, (2) stored under diurnal variations of 3-4, 3-11, and 5-10° C. for varying periods; and (3) treated with combination of constant temperature storage with germination at alternating temperatures. Early experiments on the survival and growth of seedlings from germinated seeds showed that the subsequent mortality depended a great deal on the initial treatment to which the seeds were subjected. The use of distilled water on seeds during moist sanded refrigeration, absorbent cotton as a water-holding medium for carrying seeds during period of germination, the use of thoroughly washed river sand, and prolonged periods of storage at 3½° C. were among the important suggestions of past work.

Proposed work: To determine if the germination response of various species of Ribes seeds can be in any manner correlated with the taxonomic units of the genus. It is proposed to start cultures of seeds of 40 species of Ribes in each of the following pre-germination stratifications: (1) 6 months at 0° C., (2) 4 months at 3½° C., (3) 4 months at 5° C., and (4) 6 months at 10° C. Cultures of seeds will also receive the following diurnal alternation of temperature treatments: (5) 5 and 10° C. for 3 months, and (6) 10 and 20° C. for 3 months. The six treatments will then be compared as to efficiency in breaking the seed dormancy of the various Ribes species.

RECOMMENDATIONS FOR FIELD USE

The drenching of aerial parts of R. petiolare and R. erythrocarpum with "one pound"[1] sodium chlorate is the only method described under this section of the report which can be considered as a general scheme for Ribes eradication; yet for special field problems and as an auxiliary method to hand pulling, chemical treatment can be turned into a valuable eradication tool for most of the Ribes encountered in control operations. Experimental work has progressed to the point where these field conditions can be described in general terms and specific chemical treatments recommended. In subsequent paragraphs the writer will describe for each important Ribes species the special conditions under which chemical treatment should be considered as an auxiliary method to that of hand pulling. A special plea is made that the data presented as field recommendations should be made known to all eradication supervisors so that the scope and limitations of chemical work may be clearly understood.

Tentative recommendations are given for the chemical treatment of Berberis vulgaris.

R. petiolare. Complete coverage of aerial plant parts and subsequent wetting of the ground with one pound[2] sodium chlorate is recommended. In terms of dosage this is equivalent to 0.20 to 0.30 pound of sodium chlorate per 100 feet of live stem. Whenever R. petiolare sites are partially submerged as a result of high water, (caused by beaver dams, windfall or other agencies) such areas should be drained before the attempt is made to treat the Ribes with chemicals. Spraying operations should not commence before all swampy areas have reached their early-summer low level and should cease not later than the first week in August. Animal glue should be used as a sticker and spreader at the rate of approximately 0.01 per cent of the spray solution. One-half pint of stock glue solution should be added to ten gallons of water before dissolving the chemical. For this purpose a stock solution of glue should be made up as follows: Soak one-half pound of glue in a small volume of cold water over night before making up to volume with the requisite quantity of warm water; or, for immediate use, add one quart of water to the glue and warm the mixture with constant stirring until a homogeneous solution results. Make up to volume with cold water. Best results are secured from the use of the better grades of animal glue. Thus, the purchaser should specify a clear amber-colored animal flake glue.

(1) Throughout this section of the report "one pound" sodium chlorate signifies an aqueous solution of sodium chlorate made by adding one pound of chemical to a gallon of water.

(2) A concentration of one pound per gallon is believed to have several advantages over the former concentration of 0.83 pounds. Thus, by reducing slightly the volume of spray applied per unit area spraying time can be saved without increasing chemical cost. Furthermore, gallons used and pounds of chemical used will be the same, thus facilitating the application of a definite dosage.

A practical test of fireproofed clothing that was undertaken last year showed that some skin irritation still results from protracted wearing of the cloth. Until the treatment has been perfected no recommendation can be made regarding its general use. Past regulations regarding the field and personal fire hazards of sodium chlorate should be strictly enforced.

R. *inerme*. A general work plan has recently been formulated for stream type eradication; this plan divides R. *inerme* areas into three classes arbitrarily designated as A, B and C to be worked respectively by bulldozer, by a combination of burning and hand pulling and by a combination of hand pulling and chemicals. This report can deal authoritatively only with recommendations for class C work. In this scheme, hand pulling is a preparatory treatment and serves to remove all small plants and isolated bushes which are expensive and difficult to eradicate by chemicals. Thus, subsequent chemical work is confined to small plots of ground having a relatively high Ribes population. The aerial plant parts as well as the ground within the limits of these clumps or "eradication units" are then drenched with one pound sodium chlorate at the rate of 30 to 50 pounds per square rod. The dosage might also be expressed as 3 to 5 pounds per 100 feet of live stem.

R. *lacustre*. Chemical methods are not recommended for this species unless hand eradication seems to be very costly. If a real need for chemical work arises, R. *lacustre* should be handled according to the plan suggested for R. *inerme*, particularly if it is intermingled with the latter species. For areas containing only R. *lacustre*, the dosage of sodium chlorate can be safely reduced to the lower limits of that named for R. *inerme*, namely; 3 pounds per 100 feet of live stem or 0.3 pound as a minimum dose for small bushes.(3)

R. *viscosissimum*. Chemical work on this species as a single method of treatment should be limited to heavily populated areas close to transportation facilities. If the site is reasonably moist and can be conveniently watched against fire, one pound sodium chlorate should be applied as a combination aerial spray and soil drench at the rate of 2 pounds per 100 feet of live stem with a minimum dosage of 0.2 pound for bushes having 10 feet of live stem or less. If the bushes are growing in dry soil and the location is somewhat hazardous from the point of view of fire, Diesel oil should be used at the rate of 1 gallon per 100 feet of live stem or 1 pint for small bushes; aerial plant parts and soil adjacent to the crown of the plant should be treated in this operation. As an auxiliary method to hand pulling application of sodium

(3) As a regular practice bushes having 10 feet of live stem or less should be hand pulled. When small bushes must be treated with chemicals a minimum dose of 0.3 pound of chemical should be used.

A practical test of fireproofed clothing, that was undertaken last year showed that some ...ble fire resistance still results from continued wearing of the cloth. Until the treatment has been perfected a recommendation can be made regarding its general use. Road regulations regarding the flats and present fire hazards of sodium chlorate should be strictly enforced.

B. lutea. A proposed ... plan has recently been formulated for ... type eradication; this plan divides B. lutea areas into three classes arbitrarily designated as A, B and C, to be worked respectively by bulldozers, by a combination of burning and hand pulling and by a combination of hand pulling and chemicals. This report now deals ... exclusively only with recommendations for class C areas. In this scheme, hand pulling is a preliminary treatment and serves to remove all small plants and isolated bushes which are expensive and difficult to eradicate by chemicals. Thus, subsequent chemical work is confined to small plots of ground having a relatively high ... population. The aerial plant parts as well as the ground within the limits of these clumps of "... units" are then drenched with one pound sodium chlorate at the rate of 20 to 30 pounds per square rod. The ... should also be expressed as 3 to 5 pounds per 100 feet of live stem.

B. laevigata. Chemical methods are not recommended for this species unless hand eradication seems to be very costly. If in that case (or ... work arises), B. laevigata should be treated according to the plan suggested for B. lutea, particularly if it is intermingled with the latter species. For areas containing only B. laevigata, the dosage of sodium chlorate can be safely reduced to the lower limits of that named for B. lutea, namely, 3 pounds per 100 feet of live stem or 1.5 pound as a minimum dose for small bushes.

B. ... Chemical work on this species as a single method of treatment should be limited to heavily populated areas where ... transportation facilities. If the site is reasonably moist and can be conveniently watched against fire, one pound sodium chlorate should be applied as a combination aerial spray and soil treatment at the rate of 3 pounds per 100 feet of live stem with a minimum dosage of 1.5 pound for bushes having 10 feet of live stem or less. If the bushes are growing in dry soil and the location is somewhat hazardous from the point of view of fire, Diesel oil should be used at the rate of 1 gallon per 100 feet of live stem or 1 pint for small bushes; aerial plant parts and soil adjacent to the crown of the plant should be treated in this operation. As an auxiliary method to hand pulling eradication of ...

(3) As a routine practice bushes having 10 feet of live stem or less should be hand pulled. When small bushes must be treated with chemicals a minimum dose of 1.5 pound of chemical should be used.

chlorate, sodium fluoride or copper sulphate to the scarified crown is strongly recommended. Bushes should be cut off at ground level, i.e., topped, prior to chemical treatment. The quantity of chemical needed for this treatment is tentatively set at 0.25 pound per bush. It is advisable to wet the mutilated crown before applying the dry chemical in order to restrict chemical treatment as much as possible to the damaged crown. By increasing slightly the amount of drinking water carried by the crew in canteens or water bottles, sufficient water would be available for these emergency treatments. If the volume of water needed for this work proves to be cumbersome, a glycerine-copper sulphate or glycerine-sodium fluoride paste might be substituted for the dry chemical and water. For an ordinary day's work, it is probable that 10 to 15 pounds of chemical would be ample for treatment of stubborn bushes.

R. *roezli*. The effectiveness of Diesel oil in dry sites has been sufficiently demonstrated to be recommended as a sound field practice whenever numerous R. *roezli* occur in areas reasonably close to avenues of transportation. If the location is too moist for Diesel oil treatment, satisfactory results can be expected from a combination aerial and soil drench with one pound sodium chlorate. The chemical should be applied at the rate of 2 pounds per 100 feet of live stem or 0.2 pound for bushes under 10 feet of live stem. As in the treatment of R. *viscosissimum*, the application of 1/4 pound of sodium chlorate, sodium fluoride or copper sulphate to the scarified crown of R. *roezli* is strongly advised as an auxiliary method to that of hand pulling when stubborn plants are encountered.

R. *nevadense*. Chemical methods should only be used on this species when hand eradication seems impractical. Large numbers of bushes conveniently located as to water supply can be effectively treated by a combination spray and soil drench with one pound sodium chlorate. Chemical should be applied at the rate of 2.0 pounds per 100 feet of live stem or 0.2 pound for bushes of less than 10 feet of live stem.

R. *erythrocarpum*. Although this species is not an eradication problem outside of Crater Lake National Park, it should be noted that it can be successfully eradicated by chemical treatment. Thorough drenching of leaves and trailing stems with one pound sodium chlorate at the rate of 0.5 pound per square yard of ground will result in 100 per cent kill of this species.

R. *bracteosum*. Plants growing in moist, shady locations adjacent to sloughs are apparently the only ones that can be satisfactorily treated with chemical. One pound sodium chlorate applied at the rate of 2 pounds per 100 feet of live stem should give satisfactory results

chlorate, sodium fluoride or copper sulphate to the scarified crown is strongly recommended. Bushes should be cut off at ground level, i.e., topped, prior to chemical treatment. The quantity of chemical needed for this treatment is tentatively set at 1/4 pound per crown. It is advisable to wet the scarified crown before applying the dry chemical in order to facilitate chemical treatment as much as possible in the damaged crown. By increasing slightly the amount of drinking water carried by the crew in canteens or water bags, sufficient water would be available for these emergency treatments. If the volume of water needed for this work proves to be cumbersome, a dry sodium chlorate or sodium-sodium fluoride paste which could be substituted for the dry chemical and water. For an ordinary day's work, it is probable that 10 to 15 pounds of chemical would be ample for treatment of stubborn bushes.

R. cereum. The effectiveness of diesel oil on dry sites has been sufficiently demonstrated to be recommended as a crop field practice wherever numerous *R. cereum* occur in areas reasonably close to avenues of transportation. If the location is too remote for diesel oil treatment, satisfactory results can be expected from a combination spray and soil drench with one pound sodium chlorate. The chemical should be applied at the rate of 2 pounds per 100 feet of live stem or 0.5 pound for bushes under 10 feet of live stem. As in the treatment of *R. [illegible]*, the application of 1/4 pound of sodium chlorate, sodium fluoride or copper sulphate to the scarified crown of *R. cereum* is strongly advised as an auxiliary method to that of hand pulling when stubborn plants are encountered.

R. [illegible]. Chemical methods should only be used on this species when hand eradication seems impractical. Large numbers of bushes conveniently located as to water supply can be effectively treated by a combination spray and soil drench with one pound sodium chlorate. Chemical should be applied at the rate of 2 pounds per 100 feet of live stem or 0.5 pound for bushes of less than 10 feet of live stem.

R. erythrocarpum. Although this species is not an eradication problem outside of Crater Lake National Park, it should be noted that it can be successfully eradicated by chemical treatment. Thorough brushing of leaves and trailing stems with one pound sodium chlorate at the rate of 0.5 pound per square yard of ground will result in 100 per cent kill of this species.

R. [illegible]. Plants growing in moist, shady locations adjacent to streams are apparently the only ones that can be satisfactorily treated with chemical. One pound sodium chlorate applied at the rate of 2 pounds per 100 feet of live stem should give satisfactory results.

on the shade slough plants. Large plants having composite crowns might be topped and the scarified crowns subsequently treated with sodium chlorate, sodium fluoride, or copper sulphate as described under field recommendations for R. roezli and R. viscosissimum.

R. irriguum. The application of sodium chlorate, sodium fluoride, or copper sulphate to the mutilated crown is also suggested for plants rooted in rock crevices or growing along talus slopes in such a way as to render hand pulling impractical. Quantity of chemical and method of treatment have been described for R. viscosissimum and R. roezli.

Berberis vulgaris. Of the chemicals that have been tested by cooperative experiments of the Divisions of Barberry Eradication and Blister-Rust Control, sodium chlorate is the only one that can at present be recommended for field use. To date it is the one chemical that has been definitely proved by field tests to be fully effective on barberry. Ammonium thiocyanate in quantities about 50 per cent more than sodium chlorate may prove to be an effective substitute but cannot be recommended for general field use until its toxicity is confirmed by further experimental tests.

For the eradication of numerous seedlings and small bushes (less than 10 feet of live stem), this project advises spraying with one pound sodium chlorate at the rate of 0.4 to 0.6 pound of chlorate per 100 feet of live stem. Large bushes should be treated by soil application of saturated aqueous sodium chlorate at the rate of 0.2 to 0.4 pound per 100 feet of live stem after the removal of duff and all surface litter. The latter scheme of eradication appears to have some economic advantages over salting for numerous large bushes. The destruction of single bushes in parks or private estates can be accomplished by cutting off the bush close to the ground and subsequently applying sodium chlorate or sodium fluoride directly to the scarified crown. The dry chemical should be sprinkled evenly over the wetted surface of the crown and all available roots. One-half pound or less of the chemical, depending on the size of the bush, should be sufficient to insure death.

The above chemical methods may be considered as having been sufficiently demonstrated on an experimental scale to merit field trial in different localities on a more or less controlled basis of large-scale test. That effective results can be expected from the use of these methods is certain; that such methods will be cheaper than the present salting plan can only be determined by comparing their costs with those of salting in a series of field tests performed over a period of years.

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For the eradication of numerous seedlings and small bushes (less than 10 feet of live stem), this chemical applied [illegible] with dry sodium chlorate at the rate of 0.4 to 0.8 pound of chlorate per 100 feet of live stem. Large bushes should be treated by a [illegible] of saturated aqueous sodium chlorate at the rate of 1.0 to 1.5 pound per 100 feet of live stem after the removal of dead and all surface litter. The latter scheme of eradication appears to have some economic advantages over pulling for numerous large bushes. The destruction of single bushes in parks or private estates may be accomplished by cutting off the bush stems at the ground and subsequently applying sodium chlorate or sodium fluoride directly to the mutilated crown. The dry chemical should be sprinkled evenly over the entire surface of the crown and all available roots. One-half pound or less of the chemical, depending on the size of the bush, should be sufficient as [illegible] scale.

The above chemical methods may be considered as having been sufficiently demonstrated in an experimental way to merit field trial in different localities on a more or less controlled scale of large-scale test. That effective results can be expected from the use of these methods is certain; that such methods will be cheaper than the present pulling plan can only be determined by comparing their costs with those of pulling in a series of field tests performed over a period of years.

PROGRESS REPORT OF STUDIES IN EFFECTIVENESS OF CONTROL, 1932

By

E. L. Joy

Junior Forester

The purpose of Ribes eradication is the protection of white pine from blister rust. Complete removal of all Ribes that are within infecting distance of a pine stand would, beyond doubt, protect that stand but practical control methods do not provide this absolute protection. Therefore it is necessary that we determine to what extent Ribes eradication, as it is practiced, protects stands of white pine. This, in general, is the purpose of studies in effectiveness of control.

To fulfill this purpose two types of studies are being conducted. These are: (1) a study to determine the effect of Ribes eradication upon the Ribes population, and (2) a study to determine the amount of pine infection resulting from known amounts of Ribes.

Only in stream type is the effect of Ribes eradication upon the Ribes population being studied. Preceding initial Ribes eradication a total of 247 permanent plots located on 14 drainages were established in 1929, 1930 and 1931. Most of these plots have been checked annually.

The amount of pine infection resulting from known amounts of Ribes is studied by surveys of pine infection centers. White pine plantations established on areas where pine infection has invaded and Ribes eradication has been performed will give additional data on this point.

The progress of the work of this project is given in the following reports:

The Growth and Regeneration of Ribes in Stream Type Following Ribes Eradication
The Influence of Stream Type Ribes Eradication on Canker Intensification
Pine Infection Study, Newman Lake, Washington
Pine Infection Study, Long Meadow Creek, Idaho
Cheekye Plot Studies, Cheekye, B. C.

PROGRESS REPORT OF STUDIES IN EFFECTIVENESS OF CONTROL, 193[illegible]

by

E. L. Joy

[illegible]

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[illegible]

[illegible]

[illegible]

THE GROWTH AND REGENERATION OF RIBES
IN STREAM TYPE FOLLOWING RIBES ERADICATION

By
E. L. Joy
Junior Forester

It is the purpose of this study to determine the effect of stream type Ribes eradication upon the Ribes population.

DESCRIPTION OF PLOTS

Permanent stream type check plots were established at right angles to the stream flow at 20-chain intervals. These plots are .2 of a chain (13.2 feet) wide and as long as the type width. For convenience of examination and computation of data, these are inspected and the data recorded by milacre units which, as used, are 6.6-foot squares.

WORK DONE

Because several of the plots fell on Ribes free areas and therefore have not yielded information of value for this study, only 176 plots (the total having Ribes before eradication) are now used. Of this total 161 were checked in 1936. The unchecked plots include eight that either were not found due to destruction of the plot stakes or could not be checked because of insufficient time, and [illegible] that are on the Ruby Creek drainage where the initial Ribes eradication has not been completed.

RESULTS

Because of the use of only part of the originally established plots, recomputations of the data have been made. Therefore, the results of this study now indicate the average Ribes population changes on several plots in a drainage instead of the average changes on the entire drainage. In other words, the study is now one of Ribes growth and regeneration following eradication on areas that supported Ribes before the disturbance.

In Tables No. 1 and No. 2 are shown for each area studied the amounts of Ribes live stem per acre before Ribes eradication and the amounts from original bushes and from seedlings each year thereafter.

[illegible]

[illegible]

by

L. [illegible] Joy

[illegible]

It is the purpose of this study to determine the effect of [illegible] type Ribes eradication upon the [illegible] population.

[illegible]

Permanent stream type check plots were established at right angles to the stream flow at [illegible]-chain intervals. These plots are .2 of a chain (13.2 feet) wide and as long as the type width. For convenience of examination and computation of data, these are bisected and the data recorded by milacre units which, as used, are 6.6-foot squares.

[illegible]

Because several of the plots fell on ribes free areas and therefore have not yielded information of value for this study, only [illegible] plots (the total having ribes before eradication) are now used. Of this total [illegible] were checked in 1932. The unchecked plots include eight that either were not found due to destruction of the plot stakes or could not be checked because of insufficient time, and 19 that are on the [illegible] Creek drainage where the initial ribes eradication has not been completed.

[illegible]

Because of the use of only part of the originally established [illegible], the results of this study now indicate the average ribes population changes on several plots in a drainage instead of the average changes on the entire drainage. In other words, the study is now one of ribes growth and regeneration following eradication on areas that supported ribes before the [illegible].

In Tables No. 1 and No. 2 are shown for each area studied the amounts of ribes live stem per acre before ribes eradication and the amounts from original bushes and from seedlings each year thereafter.

TABLE NO. 1

FEET OF LIVE STEM PER ACRE OF ALL RIBES SPECIES BEFORE AND AFTER ERADICATION
POTLATCH TIMBER PROTECTIVE ASSOCIATION

Status	Feet of Live Stem Per Acre																	
	East Fork Potlatch Creek			Mallory Creek			Deep Creek			Johnson Creek			Cameron Creek			Shattuck Creek		
	Orig-inal	Seed-lings	Total	Orig-inal	Seed-lings	Total	Orig-inal	Seed-lings	Total	Orig-inal	Seed-lings	Total	Orig-inal	Seed-lings	Total	Orig-inal	Seed-lings	Total
Before first eradication	113,649	0	113,649	59,524	0	59,524	23,804	0	23,804	39,560	0	39,560	41,266	0	41,266	66,651	0	66,651
Immediately after first eradication	not	check	ed	722	0	722	436	0	436	1,849	0	1,849	2,441	0	2,441	3,692	0	3,692
One year after first eradication	339	412	751	390	106	496	304	6	310	2,153	31	2,18[illegible]	3,370	18	3,3[illegible]	3,404	1	3,405
Two years after first eradication	558	176	734	1,200	45	1,245	626	1	627	-	-	-	-	-	-	-	-	-
Three years after first eradication	391	460	851	783	119	902	895	0	895	-	-	-	-	-	-	-	-	-
One year after second eradication	-	-	-	-	-	-	-	-	-	[illegible]50	13	[illegible]63	63[illegible]	1[illegible]	64[illegible]	1,11[illegible]	[illegible]	1,14[illegible]

TABLE NO. 2

FEET OF LIVE STEM PER ACRE OF ALL RIBES SPECIES BEFORE AND AFTER ERADICATION
CLEARWATER TIMBER PROTECTIVE ASSOCIATION

Status	Feet of Live Stem Per Acre																				
	Deer Creek			North Fork South-Fork Reed's Creek			South Fork Reed's Creek			North Fork Reed's Creek			Alder Creek			Loop Creek			Orofino Creek		
	Orig-inal	Seed-lings	Total	Orig-inal	Seed-lings	Total	Orig-inal	Seed-lings	Total	Orig-inal	Seed-lings	Total	Orig-inal	Seed-lings	Total	Orig-inal	Seed-lings	Total	Orig-inal	Seed-lings	Total
[illegible] eradication	49,638	0	49,638	66,098	0	66,098	43,798	0	43,798	38,290	0	38,290	20,040	0	20,040	43,375	0	43,3[illegible]	12,064	[illegible]	12,0[illegible]
Immediately after [illegible] eradication	202	0	202	185	0	185	139	0	139	289	0	289	1,418	0	1,418	858	0	[illegible]	[illegible]	0	[illegible]
[illegible] first eradication	[illegible]44	56	600	611	201	812	2[illegible]4	106	350	1,260	21	1,281	2,105	13	2,11[illegible]	1,457	3[illegible]	1,492	1[illegible]	[illegible]	[illegible]
Two years after [illegible] eradication	2[illegible]9	29	318	892	8[illegible]5	1,777	608	38[illegible]	993	2,165	168	2,333	3,246	41	3,287	2,223	125	2,[illegible]	-	-	-
[illegible] after [illegible] eradication	-	-	-	-	-	-	-	-	-	553	11	564	[illegible]	13	991	-	-	-	-	-	-
One year after second eradication	[illegible]	13	[illegible]4	[illegible]4	42	[illegible]	107	20	127	-	-	-	-	-	-	-	-	-	-	-	-

From Tables No. 1 and No. 2 it is seen that there was an annual increase in the total feet of Ribes live stem per acre in all but three instances. One of these exceptions was caused by sheep grazing and logging and another by logging railroad construction.

The third area, Mallory Creek, where the Ribes population showed a decrease between the 1931 and 1932 inspections, was not disturbed as were the other two. The only possible explanation of the 14[illegible] feet per acre decrease in Ribes live stem is the rapid closing in of a very dense pole stand of white pine, dense growth of other stream type brush and the accumulation of many windfalls since Ribes eradication in [illegible].

The differentiation between live stem from original bushes and from seedlings shows that in each class there is in general an increase in the Ribes live stem per acre the first and second year following Ribes eradication. The two exceptions are the East Fork of Potlatch and Mallory Creek areas where there was an increase in the live stem from original bushes but a decrease in the seedling live stem.

On only the East Fork of Potlatch and Mallory Creek areas have data been secured on the Ribes conditions the third year after the initial Ribes eradication. On both areas the original bush live stem decreased while the seedling live stem increased. Apparently there was a high mortality of seedlings between the first and second year and a rapid growth of those left between the second and third years.

In Tables No. 3 and No. 4 is shown the number of seedlings per acre at various intervals after Ribes eradication.

TABLE NO. 3

NUMBER OF SEEDLINGS PER ACRE AT VARIOUS INTERVALS AFTER ERADICATION
POTLATCH TIMBER PROTECTIVE ASSOCIATION

Status	East Fork of Potlatch Creek	Mallory Creek	Deep Creek	Johnson Creek	Cameron Creek	Shattuck Creek
1 year after first eradication	4,442	1,600	104	283	130	2
2 years after first eradication	1,722	445	(1) 11	-	-	-
3 years after first eradication	920	536	0	-	-	-
1 year after second eradication	-	-	-	47	62	8

(1) Disturbance from sheep grazing and logging.

TABLE NO. 4

NUMBER OF SEEDLINGS PER ACRE AT VARIOUS INTERVALS AFTER ERADICATION
CLEARWATER TIMBER PROTECTIVE ASSOCIATION

Status	Deer Creek	North Fork of South Fork of Reed's Creek	South Fork of Reed's Creek	North Fork of Reed's Creek	Alder Creek	Loop Creek	Orofino Creek
1 year after first eradication	213	2,557	1,019	182	135	442	2
2 years after first eradication	(1) 110	[illegible]	1,165	953	216	275	-
Immediately after second eradication	-	-	-	29	26	0	-
1 year after second eradication	34	69	26	-	-	-	-

(1) Disturbance from logging railroad construction.

Tables No. 3 and No. 4 show that on all areas there was considerable seed germination during the first year following eradication. During the second year the number per acre decreased on four undisturbed areas and increased on 2. This indicates that following eradication there is a variation in the time of seed germination on different areas.

It is evident that on most areas there are sufficient seedlings following one eradication to completely replace the original Ribes population. The second eradication, although not primarily directed at seedlings, results in a substantial reduction of their numbers. It is seen in Tables No. 1 and No. 2 that this reduction is an important factor in the live stem reduction.

THE INFLUENCE OF STREAM TYPE RIBES ERADICATION ON CANKER INTENSIFICATION

By
E. L. Joy
Junior Forester

On several areas where stream type Ribes eradication was done in 1929, pine infection centers have been found. In all cases it is evident that the Ribes in the stream type were responsible for the infection.

At the time of location of each center, a canker analysis was made and the probable year of origin determined. Checking data provided an estimate of the feet of stream type Ribes live stem per acre before eradication.

In 1932 several of these centers were studied for the purpose of determining the amount of pine infection originating after the initial eradication. For purposes of comparison studies were made of the cankers at infection centers where no Ribes eradication was performed in 1929. Table No. 1 gives the results of these studies.

TABLE NO. 1

STATUS OF RIBES ABUNDANCE AND PINE INFECTION
WHERE INITIAL RIBES ERADICATION WAS PERFORMED IN 1929
CLEARWATER FOREST AREA, IDAHO, 1932

Area	Years of Ribes Eradi-cation	Ribes Feet of Live Stem Per Acre: Before Initial Erad.	Ribes Feet of Live Stem Per Acre: After Erad.	Year Infec-tion Stu-died	No. of Infec. Trees Studied	No. of Can-kers Found	Per Cent of Cankers Formed: 1929 or Before	Per Cent of Cankers Formed: Since 1929
Deer Creek near C.P.F.A., Head-quarters, Ida. T.	1929	21,242		1931	168	312	100.0	0.0
38N., R.5E., S.23,26	1931		87	1932	69	101	100.0	0.0
North Fork Reed's Creek, 3/4 mile be-low Headquarters,	1929	28,810						
Ida., T.38N., R.5E.,	1931			1930	7	34*	100.0	0.0
S.15	1932		5	1932	6	15	100.0	0.0
Alder Creek, 3/4 mile below mouth of	1929	11,524						
Loop Creek, T.38N.,	1931							
R.5E., S.8,9	1932		56	1932	9	88	100.0	0.0

STATUS OF RIBES ABUNDANCE AND PINE INFECTION
WHERE RIBES ERADICATION WAS NOT PERFORMED IN 1929
CLEARWATER FOREST AREA, IDAHO, 1932

Area	Years of Ribes Eradi-cation	Ribes Feet of Live Stem Per Acre: Before Initial Erad.	Ribes Feet of Live Stem Per Acre: After Erad.	Year Infec-tion Stu-died	No. of Infec. Trees Studied	No. of Can-kers Found	Per Cent of Cankers Formed: 1929 or Before	Per Cent of Cankers Formed: Since 1929
North Fork of the Clearwater River near Quartz Creek T.40N., R.8E., S.22	1932	(Est.) 2,000	69	1932	23	204	[illegible]	[illegible]
Hemlock Creek near Weitas Ranger Sta-tion, T.37N., R.8E. S.9,16	1932	(Est.) 25,000	61	1932	19	360	3.1	96.9
Elk Creek just above Oxford Ranger Station, T.38N., R.7E., S.21	1932	(Est.) 25,000	No eradi-cation	1932	4	16	33.3	66.7

*These cankers were destroyed.

It is notable that at no pine infection center adjacent to a stream type area worked in 1925 were there any cankers found that originated after Ribes eradication. Centers on unworked areas, however, consisted chiefly of cankers formed after 1925. Although these data do not give any measure of the disease intensification by upland Ribes, it is evident that the stream type work has been very effective in retarding spread of the disease on immediately adjacent areas.

A pine infection center, probably started on *Ribes inerme* in 1922, was found at Bowman Lake in the spring of 1928. Because [illegible] *R. inerme* and *R. lacustre* occur in this vicinity it was decided that a study should be made of the disease-spreading power of *R. lacustre* after the removal of *R. inerme*.

The preliminary work of [illegible] mapping and eradicating the *R. inerme* was done in the fall of 1928 and spring of 1929. During the summer of 1929 the locations of white pines and *R. lacustre* bushes were plotted and these bushes examined for infection. Data were recorded on the size and age of pines, size of Ribes and amount of infection on each. All *R. inerme* bushes found during this period were removed.

Each year since 1929 the area has been reworked for *R. inerme* and data taken on the plotted pines and Ribes. During the past two years a field weather station has been operated for the purpose of measuring the meteorological factors affecting the spread and intensification of the disease.

RESULTS

A. Eradication of R. inerme

In Table No. 1 is shown the amounts of *R. inerme* removed from the plot in each of the past four years.

Table No. 1

[illegible]

Year	Feet of Live Stem Eradicated	Cost of [illegible]
[illegible]	[illegible]	1.80
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Grand Total	[illegible]	[illegible]

It is notable that at [illegible] quarter adjacent to a stream type area worked in 1928 were there any cankers found that really [illegible] located after ribes eradication. Centers on unworked areas, however, consisted chiefly of cankers formed after 1929. Although these figures do not give any measure of the disease intensification by upland areas it is evident that the stream type work has been very effective in retarding spread of the disease on immediately adjacent areas.

PINE INFECTION STUDIES, NEWMAN LAKE, WASHINGTON

By

E. L. Joy,
Junior Forester

INTRODUCTION

A pine infection center, probably started on Ribes inerme in 1923, was found at Newman Lake in the spring of 1928. Because only R. inerme and R. lacustre occur in this vicinity it was decided that a study should be made of the disease-spreading power of R. lacustre after the removal of R. inerme.

The preliminary work of surveying, mapping and eradicating R. inerme was done in the fall of 1928 and spring of 1929. During the summer of 1929 the locations of white pines and R. lacustre bushes were plotted and these hosts examined for infection. Data were recorded on the size and age of pines, size of Ribes and amount of infection on each. All R. inerme bushes found during this period were removed.

Each year since 1929 the area has been reworked for R. inerme and data taken on the plotted pines and Ribes. During the past two years a field weather station has been operated for the purpose of measuring the meteorological factors affecting the spread and intensification of the disease.

RESULTS

A. Eradication of R. inerme

In Table No. 1 is shown the amounts of R. inerme removed from the plot in each of the past four years.

TABLE NO. 1

AMOUNT OF R. INERME ERADICATED FROM THE NEWMAN LAKE PLOT, WASHINGTON, 1929-1932

Year	Feet of Live Stem Eradicated	Feet of Live Stem Per Acre
1929	126,884	2,820
1930	1,012	22
1931	516	11
1932	373	8
Grand Total	128,785	2,861

B. Ribes Data

In 1932 two inspections were made of the R. lacustre bushes on the plot and quantitative estimates of infection recorded. The number of bushes, classified as to shade form, that were infected at each inspection is shown in Table No. 2, while Table No. 3 gives the analysis of the infection on these bushes.

TABLE NO. 2

NUMBER OF RIBES LACUSTRE BUSHES INFECTED AT EACH INSPECTION
NEWMAN LAKE, WASHINGTON

Degree of Shading	Period of Examination	Total Number Bushes Examined	Number Bushes Infected: At Both Previous and Present Examinations	Newly Infected	Total	Previously But Not When Examined	Total to Date	Per Cent Total Bushes Infected to Date
No	June, 1932	36	0	5	5	0	5	13.9
Shade	Aug. 1932	35	2	2	4	5	9	25.7
Half	June, 1932	285	0	64	64	0	64	22.4
Shade	Aug. 1932	282	57	52	109	9	118	41.7
Full	June, 1932	283	0	47	47	0	47	16.6
Shade	Aug. 1932	281	41	49	90	8	98	34.9
All	June, 1932	604	0	116	116	0	116	19.2
Forms	Aug. 1932	598	100	103	203	22	225	37.6

TABLE NO. 3

ANALYSIS OF INFECTION ON LIVING LEAVES OF RIBES LACUSTRE,
NEWMAN LAKE, WASHINGTON

Degree of Shading	Period of Examination	Total Number Leaves Infected	Per Cent Infection Per Infected Leaf	Total Infection Converted to Equivalent Number Leaves 100 Per Cent Infected: Uredinia	Telia	Necrotic	Total
No	June, 1932	56	2.2	1.0	.1	.1	1.2
Shade	Aug. 1932	272	4.5	1.3	1.3	9.6	12.2
Half	June, 1932	1,232	3.0	37.6	2.3	.1	40.0
Shade	Aug. 1932	24,760	10.3	25.6	1,300.6	1,224.2	2,550.3
Full	June, 1932	985	4.0	36.7	1.9	.8	39.4
Shade	Aug. 1932	11,409	11.8	141.4	619.3	585.6	1,346.3
All	June, 1932	2,373	3.4	75.3	4.3	1.0	80.6
Forms	Aug. 1932	36,441	10.7	168.2	1,921.2	1,819.4	3,908.8

It is seen in Table No. 2 that a higher percentage of bushes in half shade were infected than of those in full shade or in the open. This substantiates similar results obtained in 1921.

Of the total number of infected bushes, 52 per cent showed infection in June. Between June and August the greatest increase of infected bushes occurred in the full shade group. The indication from these points is that after a general early season infection of bushes of all forms, those in full shade are more favorably situated for rust invasion. However, variations in weather conditions alter this factor as is evidenced by the fact that in 1921 the percentage of bushes infected before June was larger and between June and August smaller than in 1922.

In Table No. 3 the analysis of infection on these bushes shows that the average amount of infection per infected leaf was greatest for bushes in full shade. However, because of much greater leafage, the half shade form produced a much larger amount of effective infection as shown by the computed number of leaves 100 per cent infected with telia.

A detailed study of the infection development on eight bushes was made at 10 to 15-day intervals throughout the season. The results of this study are shown in Table No. 4.

TABLE NO. 4

ANALYSIS AT 10 TO 15 DAY INTERVALS OF INFECTION ON LIVING LEAVES OF EIGHT R. LACUSTRE BUSHES, NEWMAN LAKE, WASHINGTON

Degree of Shading	Inspection Date	Total No. of Leaves Infected	Per Cent Infection Per Leaf	Total Infection Converted to Equivalent Number Leaves 100 Per Cent Infected			
				Uredinia	Telia	Necrotic	Total
No Shade (2 bushes)	June 7	35	1.0	0.35	Neg.		0.35
	June 20	50	1.0	0.30	0.15	0.05	0.50
	July 5	40	1.0	0.14	0.16	0.10	0.40
	July 15	65	2.0	0.32	0.46	0.52	1.30
	July 25	290	2.0	0.24	0.87	4.64	5.75
	Aug. 5	296	3.0	0.09	0.62	8.17	8.88
	Aug. 15	285	3.0		0.26	8.29	8.55
	Aug. 25	230	3.0	0.14	0.34	6.42	6.90
	Sept. 6	150	3.0	0.04	0.14	4.32	4.50
	Sept. 15	147	3.0	0.04	0.09	4.28	4.41
Half Shade (6 bushes)	June 7	187	1.2	2.23	0.01		2.24
	June 20	750	4.0	24.42	5.28	0.30	30.00
	July 5	1,542	7.0	42.10	57.64	8.20	107.94
	July 15	2,705	12.0	68.17	139.58	116.85	324.60
	July 25	2,954	13.8	44.02	247.04	116.59	407.65
	August 5	3,180	14.2	28.00	239.33	184.23	451.56
	August 15	3,206	13.6	22.67	189.23	224.11	436.01
	August 25	3,187	11.8	37.61	133.13	205.33	376.07
	Sept. 6	2,685	10.8	33.06	111.93	144.99	289.98
	Sept. 15	1,936	10.4	12.89	55.57	132.89	201.35

From Table No. 4 it is evident that uredinial development at Newman Lake in 1932, after the early season infection, reached peaks about July 15 and August 25. The weather records show 0.22 inches of rain on July 3-4 and 0.07 inches on August 11-12. Both of these periods of rainfall were preceded and followed by at least seven rainless days. These facts indicate that from 10 to 15 days after summer rains there will be increased uredinial intensification.

At the inspection following the one at which the peak of uredinial infection was found, the high point in telial development was reached. This period was 10 days. However, it is notable that 21 days after the uredinial peak there was almost as much telial production as on the 10th day.

In Table No. 5 there is shown a comparison of the amounts of telia produced during each of the past four years.

TABLE NO. 5

COMPARISON OF AMOUNT OF TELIA PRODUCED IN 1929, 1930, 1931 AND 1932

Period Examined	Computed Number of Leaves 100 Per Cent Infected With Telia	Per Cent of Total Infection Which is Telia
June-August 1929	0.02	2.4
June-August 1930	31.00	53.4
June, 1931	16.00	28.0
July, 1931	555.00	62.8
Aug. 1931	760.00	63.9
June, 1932	4.31	6.0
Aug. 1932	1,921.17	48.7

The large number of cankers started in 1927, before the removal of R. inerme, had not started to produce aecia in 1929 which accounts for the small amount of infection on R. lacustre that year. With the great volume of aeciospores from these cankers in 1930 came the heavy production of telia that year. The combined 1927 and 1928 origin cankers caused the still larger amount of telia in 1931.

In 1932 there were only 274 fruiting cankers whereas there were 913 in 1931. With this large decrease in production of aecia, the increase in R. lacustre infection must be attributable mainly to more favorable weather conditions. Comparison of the precipitation records of the two years shows that the total amount from June 6 to September 10, 1932, was only 18 per cent of the amount for the same period in 1931. However, rains during the first ten days of June and July in 1932 gave better seasonal distribution of the total precipitation. A larger amount of precipitation in April and May, 1932, than in the same two months in 1931 was also of great significance in that more Ribes foliage was developed.

Although the increase in the volume of Ribes infection in 1932 was greater than in 1931, it is seen in Table No. 5 that the percentage of the total that developed telia was smaller. A large amount of defoliation from heavy infection probably accounts for the major part of this decrease.

C. Pine Infection Data

In Table No. 6 the 1932 pine infection data are compared with similar data secured in the three previous years. Table No. 7 shows the analysis of cankers found in 1932.

TABLE NO. 6

PINE INFECTION DATA, NEWMAN LAKE, WASHINGTON, 1929-1932

Item	Year			
	1929	1930	1931	1932
Number of acres studied	25.4	36.2	36.3	47.6
Total number of pines examined	752	1,334	1,335	1,437
Total number of pines infected	66	113	128	170
Per cent of pines infected	8.8	8.5	9.6	11.8
Number pines killed by blister rust	0	0	4	7
Total number of cankers	565	1,591	1,935	2,156
Number cankers per infected pine	8.6	14.2	15.1	12.7

TABLE NO. 7

ANALYSIS OF CANKERS FOUND IN 1932, NEWMAN LAKE, WASHINGTON

Year of Growth Infected	Juv.	Current Year Pyc.	Pycnial Scars	Produced Aecia			Fruited Previously But Not Now	Dead	Miss-ing	Total
				Once	Twice	Sev.				
1931	1									1
1930										0
1929										0
1928	1	1	3	3	5			20		33
1927	2	2	32	18	43	3	24	262		386
1926	1	5	73	22	102	9	69	808	4	1,094
1925		4	36	13	35	1	25	359		473
1924		1	7	2	9	2	4	89		114
1923		1	2	1		1	1	16		22
1922		1				2	3	12		18
1921			1			1	2	6		10
1920								1		1
1919								1		1
1918							1			1
?								2		2
Totals	5	15	154	59	194	19	130	1,578	4	2,156

The eradication of R. inerme in the spring of 1929 removed the disease-spreading effect of this species after 1928. Therefore, all cankers appearing on growth produced after 1928 can be charged to R. lacustre.

In Table No. 7 it is seen that in 1932 only one canker formed since 1928 was found. This is the first on the plot that can be definitely attributed to R. lacustre. Undoubtedly it was started in 1931 which gives the unusually short incubation period of one year.

It is notable that 73 per cent of the total cankers found were dead. Secondary fungi seem to be hastening this death although shading and other branch cankers nearer the tree trunk are responsibile in most cases.

Tuberculina maxima, the lilac fungus parasitic on blister rust cankers, was found on a few cankers of 2 trees. This is the first discovery of this fungus on white pine blister rust in the Inland Empire. A careful check will be made of the spread of this parasite at Newman Lake.

PINE INFECTION STUDIES, LONG MEADOW CREEK, IDAHO

By
E. L. Joy,
Junior Forester

PURPOSE

The purpose of this study is to determine the effectiveness of Ribes eradication in controlling white pine blister rust on the Long Meadow infection area.

WORK DONE PREVIOUS TO 1932

Ribes Eradication

With the discovery of this infection center in August, 1929, stream type Ribes eradication then in progress along Long Meadow and Three Bear Creeks was supplemented by upland Ribes eradication. A total of about 300 acres was worked which included the infection area and adjacent land. In 1931 this area was reworked and the limits of eradication extended, making a total of [illegible] acres eradicated of Ribes.

Studies of the Disease

Studies of the disease have been conducted annually on the Long Meadow Creek infection area since its discovery in 1929. Previous to 1932 these studies consisted of the following:

1929. (1) Scouting to determine the limits of infection.

(2) Determining the quantity of Ribes and Ribes infection, and quantity and age of pine infection on 4.1 acres.

1930. (1) Determining by a 4 per cent cruise (13.2 feet wide strips 5 chains apart) the quantity, distribution and age of pine infection and quantity of Ribes on the entire infection area.

1931. (1) The same as in 1930 but by the use of every other strip established in 1930 which gave a 2 per cent cruise.

WORK DONE IN 1932

Because the strips that were run in 1931 were marked in 1930 only by stakes set at 1-chain intervals in the center of the strips, it was impossible to locate exactly the same trees in 1931 that were used in 1930. This led to the adoption in 1932 of study methods that would yield data from the same trees in each succeeding survey.

In the fall of 1932 the strips used in 1931 were reworked. Instead of using every tree on these strips as in 1930 and 1931, a few

representative trees, the majority of which ranged in height from 6 to 30 feet, were selected in each chain segment which had trees. These were numbered, tagged and examined for cankers.

A new method of analyzing cankers was used. Instead of tallying each canker found according to its stage of development and the year of growth infected, and then deducting from the resulting canker pattern the number of cankers originating in each exposure year, each canker was recorded directly as to the probable year of its origin. This classification is based on:

1. Stage of canker development.
2. Year of growth infected.
3. Canker length.
4. Normal diameter of the growth or growths on which the canker occurs.
5. Vigor of the growth or growths on which the canker occurs.
6. Number of years' needles retained.

In order to provide a basis for determining canker age by the use of these factors, studies have been made of the relationship between normal growth diameter and canker length for various aged cankers.

In addition to the analysis of cankers on the trees on the strips two analyses were made of the cankers on 25 additional scattered trees. The first was a classification of each according to the canker stage and the year of growth infected and the second according to the probable year in which the canker originated and the year of growth infected. From these it is possible to compare the two methods.

Another use of the data from these 25 trees is to study the distribution pattern of cankers of the same age. For both of these studies trees with incipient and fresh pycnia cankers were selected.

RESULTS

Ribes Data

The results of checking for Ribes on the Long Meadow area after the 1930 and 1931 Ribes eradications and the measure of Ribes found on the infection area in conjunction with the disease studies are shown in Table No. 1.

representative trees, the majority of which ranged in height from 4 to 30 feet, were selected in each chain segment which had trees. These were numbered, tagged and examined for cankers.

A new method of analyzing cankers was used. Instead of tallying each canker found according to its stage of development and the year of growth infected, and then deducting from the resulting canker pattern the number of cankers originating in each respective year, each canker was recorded directly as to the probable year of its origin. This classification is based on:

1. Stage of canker development.
2. Year of growth infected.
3. Canker length.
4. Normal diameter of the growth or growths on which the canker occurs.
5. Vigor of the growth or growths on which the canker occurs.
6. Number of years' needles retained.

In order to provide a basis for determining canker age by the use of canker length, studies have been made of the relationships between normal growth diameter and canker length for various aged cankers.

In addition to the analysis of cankers on the trees on the strip two analyses were made of the cankers on 26 additional scattered trees. The first was a classification of each canker according to the canker stage and the year of growth infected and the second according to the probable year in which the canker originated and the year of growth infected. From these it is possible to compare the two methods.

Another use of the data from these 26 trees is to study the distribution pattern of cankers of the same age. For this purpose small trees with incipient and fresh pycnia cankers were selected.

RESULTS

Ribes Data

The results of checking for Ribes on the Long Meadow area after the 1939 and 1941 Ribes eradications and the presence of Ribes found on the infection area in conjunction with the disease studies are shown in Table No. 1.

TABLE NO. 1

RIBES CONDITIONS ON THE LONG MEADOW INFECTION AREA
1929-1932

Eradication Status	Year Checked	Acres Sampled	Per Cent Sample	Ribes P.L.S. Per Acre R. lac.	R. vis.	Total
Before 1929 Eradication (2)	1929	4.1	100	1,881	27	1,908
Before 1929 Eradication (1)	1929	300.0	2	803	278	1,081
After 1929 Eradication (3)	1929	200.0	2	145	85	230
After 1929 Eradication (2)	1930	69.0	4	309	32	341
After 1931 Reeradication (3)	1931	322.2	2	9	3	12
After 1931 Reeradication (2)	1931	108.0	3	10	2	12
After 1931 Reeradication (2)	1932	96.0	2	18	37	55

(1) Obtained by totaling estimated feet of Ribes live stem pulled by eradicators and feet of Ribes live stem calculated from checking after Ribes eradication.
(2) Obtained as part of disease survey information.
(3) Results of checking after Ribes eradication.

From both the checking and disease study cruises in 1931, it was calculated that reeradication that year reduced the quantity of Ribes per acre to 12 feet which is considerably less than the amount arbitrarily used to denote protection. However, a cruise in 1932 of 96 of the 108 acres checked during the disease survey in 1931 shows that in one year the Ribes live stem increased to 55 feet per acre or slightly over the 50-foot limit. This additional live stem consists chiefly of sprouts from remaining crowns and new growth on 2-year-old seedlings along the railroad grade constructed in 1930.

Pine Infection Data.

Suitable study trees were found on 75 of the 96 chain segments covered. A total of 684 pines were examined, 303 or 44.3 per cent of which were infected. On these trees were found 2,580 cankers.

The distribution of these cankers according to the probable years of origin and the approximate amount of Ribes live stem per acre causing infection during each of these years are shown in Table No. 2.

TABLE NO. [illegible]

[illegible]

Eradication History	Year Checked	Acres Checked	Per Cent Sample	R. lac.	R. vis.	Total
Before 1929 Eradication (3)	[illegible]	4.1	100	1,661	27	[illegible]
After 1929 Eradication (1)	1929	300.0	2	[illegible]	[illegible]	[illegible]
After 1929 Eradication (2)	[illegible]	300.0	2	145	[illegible]	[illegible]
After 1929 Eradication (3)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
After 1931 Reeradication (3)	[illegible]	[illegible]	[illegible]	9	2	12
After 1931 Reeradication (3)	[illegible]	[illegible]	[illegible]	10	2	12
After 1931 Reeradication (3)	[illegible]	[illegible]	1	14	[illegible]	[illegible]

(1) Obtained by totaling estimated feet of Ribes live stem pulled by eradicators and feet of Ribes live stem calculated from checking after Ribes eradication.
(2) Obtained as part of disease survey information.
(3) Results of checking after Ribes eradication.

From both the checking and disease study [illegible] in 1931, it was calculated that reeradication that year reduced the quantity of Ribes per acre to 12 feet which is considerably less than the amount arbitrarily used to denote protection. However, a [illegible] in 1933 of [illegible] of the [illegible] acres checked during the disease survey in 1931 showed that in one year the Ribes live stem increased to [illegible] feet per acre or [illegible] over the [illegible] limit. This additional live stem consists chiefly of sprouts from remaining crowns and new growth on [illegible]-year-old seedlings along the railroad grade constructed in 1930.

Pine Infection Data.

Suitable study trees were found on 75 of the 96 chain segments covered. A total of [illegible] pines were examined, [illegible] or [illegible] per cent of which were infected. On these trees were found 2,560 cankers.

The distribution of these cankers according to the probable years of origin and the approximate amount of Ribes live stem per acre causing infection during each of these years are shown in Table No. [illegible].

TABLE NO. 2

DISTRIBUTION OF CANKERS FOUND ACCORDING TO THE PROBABLE YEAR OF ORIGIN AND THE APPROXIMATE AMOUNT OF RESPONSIBLE RIBES, LONG MEADOW INFECTION AREA

Probable Years of Origin	Number of Cankers	Ribes F.L.S. Per Acre
1923	1	1,908
1926 and 1927	2,135	1,908
1928	343	1,908
1929	40	230*
1930	41	341

*After Ribes eradication in September 1929. Probably part of the 1929 origin cankers were formed before Ribes eradication.

Undoubtedly the 1929 Ribes eradication was at least partly responsible for the sharp decline in canker intensification in 1929 and 1930. In 1933 a still greater decrease should be found for the 1931 origin cankers as a result of the reduction of Ribes that year to 12 feet per acre.

From the study of this area in 1930 it has been calculated that the nucleus of this center was 83 cankers of 1923 origin. Assuming that for the entire infection area the distribution of cankers according to years of origin is as shown in Table No. 2, it follows that there were in 1932 a total of 83 x 2,560 or 212,480 cankers. Thus it follows that for every canker on the area in 1923 there were 2,560 cankers by the end of 1930.

In 1931 it was computed that for every canker formed in 1923 there were 2,443 by the end of 1929. From the 1932 study data we find the relationship to the end of 1929 to be 2,519 to 1. This indicates that the results of the two methods of study are reasonably close and can be considered comparable.

The study of the cankers on 26 selected trees gives further evidence of the practicability of canker classification according to the years of origin.

These trees, most of which were dominant, varied in height from 3.5 to 20 feet, the majority falling in the 6 to 10-foot class. As few as 2 years' needles were held on a portion of one tree and as many as 7 on a portion of another. It is notable, however, that on some portion of every tree 5 years' needles were held.

On these trees a total of 597 cankers was found. Tables No. 3 and No. 4 show the analysis of these cankers by the two methods.

TABLE NO. [illegible]

[illegible]

Probable Years of Origin	Number of Cankers	[illegible]
1927	1	1,[illegible]
[illegible] and 1926	[illegible]	[illegible]
1928	245	1,908
1929	40	282*
1930	41	341

*After Ribes eradication in September 1929. Probably part of the 1929 origin cankers were formed before Ribes eradication.

Undoubtedly the 1929 Ribes eradication was at least partly responsible for [illegible] 1930. In 1933 a still greater decrease should be found for the 1931 origin cankers as a result of [illegible] per acre.

[illegible] 1930.

In 1931 it was computed that for every canker formed in 1923 [illegible]

The [illegible] years of origin.

These trees, most of which were dominant, varied in height from 3.5 to 20 feet, the majority falling in the 6 to 10-foot class. As few as 2 years' needles were held on a portion of one tree and as many as 7 on a portion of another. It is notable, however, [illegible] every tree 5 years' needles were held.

On these trees a total of 397 cankers was found. Tables No. 3 and No. 4 show the analysis of these cankers by the two methods.

TABLE NO. 3

ANALYSIS OF CANKERS ON 26 SELECTED TREES BY CANKER STAGE AND YEAR OF GROWTH INFECTION ENTERED (METHOD 1)

Year Growth In-fected	Canker Stage										Total
					Aecial Production						
	First Symptoms	Juve-nile	First Pycnia	Pycnial Scars	Once	Twice	Sev-eral	Re-tarded*	Dead	?	
1930	3	3									6
1929	11	20	6								37
1928	14	66	16	5					1		102
1927	4	43	30	54	13			1	5		148
1926		4	12	74	51	10	2	7	12		172
1925				32	33	12	2	1	5		85
1924				3	1	1	3				8
1923					2	2					4
1922							1				1
?				9	4				6	18	37
Total	32	136	64	180	109	26	8	9	25	18	597

*Cankers that have pycnial scars but have not developed aecia.

TABLE NO. 4

ANALYSIS OF CANKERS ON 26 SELECTED TREES BY PROBABLE YEAR OF ORIGIN AND YEAR OF GROWTH INFECTION ENTERED (METHOD 2)

Year Growth Infected	Probable Year in Which Canker Originated					Total
	1930	1929	1928	1926-1927	?	
1930	6					6
1929	28	9				37
1928	55	39	8			102
1927	28	46	74			148
1926		17	142	12	1	172
1925			67	18		85
1924			3	5		8
1923			1	3		4
1922				1		1
?			9		28	37
Totals	115	110	304	39	29	597

The canker analysis by method 1, given in Table No. 3, shows that cankers were formed in each year from [illegible] to 1930 but there is no simple and definite method of computing the number of cankers originating in each of these years. Therefore, this type of analysis does not lend itself to an accurate measure of the effectiveness of Ribes eradication in controlling blister rust.

In Table No. 4, however, it is evident that method 2 gives the information secured by method 1 and in addition shows the allocation of cankers by years of origin. Therefore, from sample analyses, developed by method 2, it is possible where the Ribes population has been reduced, to determine the comparative amounts of pine infection caused by different amounts of Ribes. This is the measuring stick needed in determining the effectiveness of control.

Another advantage of the second method over the first is that the distribution of cankers of the same age according to the years' growth infected is more definite. In Table No. 4 it is seen that the greatest number of cankers formed in 1928, 1929 and 1930 are on growth that was produced 2 years prior to the exposure year. In other words, during each of these three years more infection entered through 2-year-old needles than through needles of any other age.

Upon examination of the first analysis of cankers on this area, which was made by method 1 in August [illegible], the pattern of [illegible] origin incipient cankers is seen to be similar to those patterns shown in Table No. 4. That is, for each of the origin years the percentage of total cankers on 2-year-old growth fall between [illegible] and [illegible].

This arrangement, although not conforming to the canker distribution in the coastal region, as determined by the Division of Forest Pathology, has been found for several Inland Empire infection areas. One factor, which is probably a partial explanation of this difference, is the generally longer retention of needles by white pines in this region.

CHEEKYE PLOT STUDIES, CHEEKYE, BRITISH COLUMBIA

By
H. N. Putnam
Associate Pathologist

PURPOSE

The Cheekye plot was established in order to determine the maximum distance white pine blister rust will spread from native Ribes to western white pines under field conditions in the West. Two other subsidiary studies are: (1) the rate of killing by blister rust of young white pines, and (2) a determination of the survival of planted pines. In 1930 an additional study was started with the planting on the plot of transplants of four species of pines. This is a study of the relative susceptibility of these species to blister rust.

WORK DONE PREVIOUS TO 1932

An account of the work done through 1930 is given in the 1930 Annual Report. The plot was not checked in 1931.

WORK DONE IN 1932

Work on the plot in 1932 was limited to the inspection of the white pines planted on the eight radii in 192[illegible] and of the four species of white pine planted in October 1930.

RESULTS

A. Infection of pines planted on radii:

The amount of pine infection found in December 1932 and in October 1930 at different distances from the center of the plot is shown in Table No. 1.

TABLE NO. 1

PER CENT OF PINES INFECTED AT DIFFERENT DISTANCES FROM CENTER OF [illegible] PLOT IN 1930 AND 1932

On or Off Plot	Distance in Chains		October 1930			December 1932		
	From Plot Center	From Circum-ference	Number Pines Exam.	Number Pines Inf.	Per Cent Pines Inf.	Number Pines Exam.	Number Pines Inf.	Per Cent Pines Inf.
On	0-4	15-19	626	91	14.5	624	331	53.0
On	4-9	10-15	749	109	14.6	747	418	[illegible]
On	9-14	5-10	748	124	15.6	746	415	[illegible]
On	14-19	0-5	685	104	15.2	677	329	48.6
Off	19-35	-	1,239	184	14.9	1,209	592	49.0
Total and Aver-age			4,047	612	15.1	4,002	2,084	52.1

In Table No. 1 it is shown that in both 1930 and 1932 there was very little difference in the amount of infection near the plot center and off the plot where Ribes were present.

During this 2-year period the number of infected pines increased 340 per cent. A similar increase in the number of pines killed by blister rust was also noted which suggests a fairly constant relationship between infected and killed trees in a uniform size class.

TABLE NO. 2

COMPARISON OF THE AMOUNTS OF INFECTION ON EACH RADIUS IN 1930 AND IN 1932, [illegible] PLOT, [illegible], BRITISH COLUMBIA

Radius	Radius Length in Chains	October 1930 Number Pines Exam.	October 1930 Number Pines Inf.	October 1930 Per Cent Pines Inf.	October 1930 Total Number Cankers	December 1932 Number Pines Exam.	December 1932 Number Pines Inf.	December 1932 Per Cent Pines Inf.	December 1932 Total Number Cankers
North	35	687	139	20.3	156	678	389	57.4	535
Northeast	29	534	59	11.1	63	529	229	43.3	300
East	24	436	76	17.4	80	425	223	52.5	321
Southeast	30	530	70	13.2	72	535	257	48.7	350
South	23½	411	32	7.8	32	405	170	44.2	237
Southwest	30	466	58	12.5	62	464	235	50.6	394
West	25	379	66	17.4	66	370	230	62.2	364
Northwest	33	604	112	18.5	125	603	351	58.3	567
Total	229½	4,047	612	15.1	656	4,003	2,084	52.1	3,008

From Table No. 2 it is apparent that in 1930 the per cent of pines infected was highest on the north, northwest, east and west radii in the order named except for the last two which had the same amount. In 1932 the west radius showed the highest per cent followed in order by the northwest and north. It is thus indicated that the infecting sporidia came from a northwesterly direction during both years.

Examination in May 1925 of the pines planted on the radii in 1923 showed that 61 per cent of the infected trees were on the northeast, east and southeast radii, indicating that infection was coming from an easterly direction. In the spring of 1926, at the time of replanting, R. bracteosum bushes having 18,927 feet of live stem were eradicated from a mile and a half of stream type east and northeast from the plot. That this eradication was effective is indicated by the fact that in 1932 the northeast, east and southeast radii produced only 34 per cent of the total infected trees in contrast to 61 per cent found on the these radii before eradicating the R. bracteosum.

TABLE NO. 3

CANKER ANALYSIS, CHEEKIE PLOT, PINES PLANTED
1926

Year of Growth Infected	Examined October 1930							Examined December 1932						
	Dis-coloration	Pycnia	Produced Aecia			Dead	Total	Dis-coloration	Pycnia	Produced Aecia			Dead	Total
			Once	Twice	Sev. Times					Once	Twice	Sev. Times		
1931								139	6					145
1930								772	204	9				985
1929	17	4					21	324	355	148	7			834
1928	110	48	1				162	23	177	322	45	4	16	587
1927	57	67	33			4	161	1	23	100	46	16	51	237
1926	4	29	84	11		31	159		1	9	14	30	107	161
1925		8	39	32	1	66	147		1		2	15	129	147
1924		2	1	3			6				1	1	4	6
Not Known													2	2
Total	194	156	158	46	1	101	656	1,259	717	618	119	66	309	3,088

Table No. 3 shows that there were nearly 5 times as many cankers found in 1932 as in 1930. Practically all of the new cankers found appear in the first three columns of the analysis made in 1932.

In 1930 a detailed analysis was made of the internodal growth by years of 10 planted pines taken at random. In 1930 and in 1932 estimates were made of the feet of needle stem of every pine. From these data the total feet of needle stem present each year from 1926 to 1931 has been calculated.

In Table No. 4 the probable number of cankers formed and the calculated feet of needle stem from 1926 to 1931 is shown.

TABLE NO. 4

RELATIONSHIP OF NUMBER OF CANKERS FORMED TO FEET OF NEEDLE STEM FROM 1926 TO 1931, CHEEKYE PLOT, BRITISH COLUMBIA

Year of Origin of Infection	Calculated Number of Cankers Formed	Calculated Total Feet of Needle Stem
1926	98	1,397
1927	186	1,658
1928	173	3,031
1929	623	6,419
1930	695	19,388
1931	1,313	36,443

13' per
9'
14'
10'
28
28'

On the basis of the calculations, there is a fairly definite relationship each year between the number of cankers formed and the feet of needle stem or the target. This suggests the probability of a fairly constant amount of aecia and consequent sporidia each year. Under conditions obtaining at Cheekye where blister rust has been present since 1913 and has become thoroughly established the Ribes present are subject to the maximum of infection each year. The resultant infection of white pines must then be in direct ratio to the amount of pine foliage as a target, modified by environmental factors such as the weather.

B. Inspection of Pine Susceptibility Plots:

In Table No. 5 there is shown the summary of data taken on the pine susceptibility plots planted in October 1930.

TABLE NO. 5

SUMMARY OF SURVIVAL AND INFECTION DATA FROM FOUR SPECIES OF PINE PLANTED IN 19[illegible]
[illegible] PLOT, BRITISH COLUMBIA, 1932

Distance of Plots From Center	No. of Plots	P. lambertiana No. Alive	P. lambertiana Per Cent Alive	P. lambertiana Per Cent Survivors Inf.	P. monticola No. Alive	P. monticola Per Cent Alive	P. monticola Per Cent Survivors Inf.	P. flexilis No. Alive	P. flexilis Per Cent Alive	P. flexilis Per Cent Survivors Inf.	P. strobus No. Alive	P. strobus Per Cent Alive	P. strobus Per Cent Survivors Inf.	Total No. Alive	Total Per Cent Alive	Total Per Cent Survivors Inf.
2 Chains	4	10	25.0	0.0	23	[illegible]	0.0	30	70.0	3.3	32	[illegible]	3.1	[illegible]	[illegible]	[illegible]
10 Chains	[illegible]	[illegible]	14.4	2.4	231	72.9	2.0	273	[illegible]	2.9	273	85.3	1.6	[illegible]	64.3	2.7
15 Chains	[illegible]	[illegible]	16.0	[illegible]	224	70.0	1.7	272	85.0	1.8	279	87.2	1.1	[illegible]	[illegible]	[illegible]
Outside Plot	1	[illegible]	[illegible]	1.6	220	[illegible]	4.1	[illegible]	[illegible]	1.2	266	[illegible]	3.5	[illegible]	[illegible]	[illegible]
Totals and Averages	[illegible]	165	[illegible]	1.8	[illegible]	[illegible]	2.7	[illegible]	[illegible]	1.8	[illegible]	[illegible]	3.1	2,534	64.0	2.2

Since these trees were planted in October, 1930 the oldest infections must necessarily have originated in 1931. Analysis of the [illegible] cankers found shows the majority on 1930 growth with a few on 1930 and 1929 growths.

On the basis of the very few cankers found, no indications of differences in susceptibility of the 4 species are apparent.

A striking difference in the survival was observed. Pinus strobus showed the highest survival. P. flexilis, P. monticola and P. lambertiana follow in the order named. The very poor survival of P. lambertiana may be due to the fact that 2-2 planting stock was used, while the planting stock of the other two species was 2-1.

C. General Observations.

Several cankers on the radial pines were found thoroughly covered by Tuberculina maxima, the lilac fungus parasitic on blister rust. In two instances the aecia were still in place and entirely covered by the parasite which had also extended over the pycnial surfaces.

A few of the planted pines had two-year-old cones whose seeds had already been shed. One-year-old cones were observed in quite large numbers.

CONCLUSION

It is definitely established that under conditions existing at Cheekye no protection of pines against blister rust can be obtained by the removal of Ribes for a distance of 1,250 feet. There can be no doubt that pine infection on the plot resulted from Ribes more than 1,250 feet away.

PHOTOGRAPHIC AND EDUCATIONAL WORK

By

H. Miller Cowling

Agent

INTRODUCTION

The policy of this department was distinctly changed from that of previous years. Photography became the major activity and educational work was conducted through the members of the Division personnel upon the basis of demand. All photographic work as well as the supplying of educational material for the Division is done by the project leader. This report deals only with the work of the Spokane office.

PURPOSE

The purpose of this project, through the help of its own photographic facilities, is first to furnish the blister rust personnel with illustrative material of all phases of investigative and practical control, the progress and results of each project, and its relationship to the entire blister rust program; and secondly, to educate the general public and special groups through the dissemination of photographs, specimens and instructive bulletins among Forest Service workers, timber owners and operators, forestry school and students, and other interested groups and individuals to the end that the potential timber assets and value of the blister rust control program will be fully appreciated.

SUMMARY OF WORK DONE

Photographic and educational work comes under four headings: (A) photography in the field, (B) photography in the office, (C) preparation and distribution of educational materials, (D) distribution of information.

A. Photography in the Field

Photography in the field has two classifications, ground and aerial. Ground photography is done with a 5 x 7 view camera and every unit being worked is visited by the photographer during the field season and all phases of the work photographed. The project leader of each unit outlines the pictures he wants taken and he or his assistant accompanies the photographer while the area is being covered. This method assures that the purpose of all pictures taken is in accord with the ideas of both project leaders.

During the 1931 season several sets of series-pictures were started. This consists of photographing an area before and shortly after working, and then rephotographing the following years from the same spot to show final results. These series are giving a very graphic record of Ribes eradication results and many more are now in progress.

At the end of the field season the complete set of pictures are examined by the entire personnel, thus giving every permanent employee an opportunity to see the conditions, methods and results in all areas where the work is progressing. A total of 101 pictures of the 1932 field activities are on file.

Through the continued cooperation of the 116th Photo Section, Washington National Guard, aerial photography was again brought into use in 1932, but along different lines than in previous years. No vertical mapping was done, but oblique or pictorial pictures were taken. This type of picture is made at an angle and gives a bird's-eye view of the areas photographed, varying in detail according to the altitutde from which they are taken, yet showing the topography and timber densities with such clearness as to make them of great value for field and office use. The relative value of vertical and oblique pictures has been the subject of much discussion, but it has been proven that in ratio of cost oblique pictures give more information than verticals for general purposes and will be more commonly used. Ninety-two aerial pictures were filed this season of the St. Joe, Coeur d'Alene and Clearwater National Forests, Mount Rainier National Park, and Clearwater Timber Protective Association.

B. Photography in the Office

Photography in the office falls under three classifications: (1) reproducing and coloring large maps for special reports, (2) reducing large maps and tables to annual report size, (3) making up photographic material for educational purposes.

1. A method of reproducing large maps and the use of oil colors to separate types or working areas was introduced this year and has met with great favor. The map to be reproduced is photographed and then enlarged, to any size necessary for the purpose, on a light weight photographic paper. The type boundaries are then inked in and the areas designated are colored in separate colors. This color appears more as a stain and is readily applied and controlled on the photographic surface of the paper and is perfectly transparent.

There are many advantages to this method. The size of the reproduced map is optional, the paper, although of light weight, is more durable than that previously used, making it ideal for field use, the colors are more quickly and evenly applied than by the former use of crayons and they remain fast through exposure to water and excessive handling, and the cost of reproducing in comparison with the previous method has been reduced 52 per cent. Plans are now under way to reproduce all of our maps by this method. The maps will be drawn showing only the essential data and will be reproduced either in whole or in part as required.

At the end of the field season the complete set of pictures are examined by the entire personnel, thus giving every permanent employee an opportunity to see the conditions, methods and results in all areas where the work is progressing. A total of 101 pictures of the 1932 field activities are on file.

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Photography in the office falls under three classifications: (1) reproducing and coloring large maps for special reports, (2) reducing large maps and tables to annual report size, (3) making up photographic material for educational purposes.

1. A method of reproducing large maps and the use of oil colors to designate types or working areas was introduced this year and has met with great favor. The map to be reproduced is photographed and then enlarged, to any size necessary for the purpose, on a light weight photographic paper. The type boundaries are then inked in and the areas designated are colored in separate colors. This color appears more as a stain and is readily applied and controlled on the photographic surface of the paper and is perfectly transparent.

There are many advantages to this method. The size of the reproduced map is optional, the paper, although of light weight, is more durable than that previously used, making it ideal for field use, the colors are more quickly and evenly applied than by the former use of crayons and they remain fast through exposure to water and excessive handling, and the cost of reproducing in comparison with the previous method, has been reduced 52 per cent. Plans are now under way to reproduce all of our maps by this method. The maps will be drawn showing only the essential data and will be reproduced either in whole or in part as required.

2. The reducing of large maps and tables to annual report size is done entirely by photographic process. This photographing is done on an 8 x 10 film and then contact printed on a light weight photographic paper manufactured in a standard 9 x 11 inch size. The prints are then trimmed to the report size, leaving a margin for binding. This method has aided greatly in reducing the size of reports without loss of detail and saved much time in both drafting and typing work. Examples of reduced maps and tables including the coloring process appear in other portions of this annual report.

3. The making up of material for educational purposes consists chiefly of printing and enlarging of field pictures or diagrammatic pictures showing all phases of the blister rust control program.

A large supply of lantern slides is necessary for fairs and conventions, where the automatic beloptican is used. The lantern slides are made in our own laboratory from field pictures and colored with water colors. This method adds flexibility to the selection of illustrations used and by making all material in the office a great saving is made in the cost of production.

C. Preparation and Distribution of Educational Material

1. Specimens. In order to completely disseminate information on blister rust the use of specimens of all phases of the disease is essential, in conjunction with the use of bulletins and pamphlets.

Specimens of the various stages of the disease are collected in the vicinity of Clarkia, Idaho. A total of forty-two quarts representing all stages of the disease on pines were gathered, and pickled in a killing solution. These specimens remain in the killing solution until distribution, either in quart lots or in individual test tubes, to prevent liberation of viable spores. No specimens of the disease on Ribes leaves were collected in 1932 as a sufficient supply is on hand to care for the needs of the coming year.

2. Demonstration boxes. During 1932 only one type of demonstration box was used, a seven stage box showing both the uredinial and telial stages on Ribes and five stages of the disease on pine. The specimens are supplemented by a one page legend covered with celluloid. One of these boxes was sent to each of the 44 blister rust camps during the field season, and five given to schools for instruction purposes.

3. Field manual. The education of temporary blister rust workers has always been a major problem of the field season. To aid in their instruction,

a field manual of 16 pages was made up which contained eleven photographic pages of distinct timber types with instructions accompanying each type picture as to method of working the respective types. The balance of the manual was made up of detailed instructions regarding the field work as prepared by the local control project. Seventy copies were made up for distribution to camp bosses and unit supervisors.

4. Pamphlets and bulletins. A complete set of pamphlets and bulletins covering every phase of the blister rust program is kept on hand for distribution. This material varies from the most technical data to a general description of blister rust and its control and the material is distributed according to the purpose for which it is to be used.

D. Distribution of Information

1. Blister rust personnel. The Western Blister Rust News Letter and the monthly personnel meetings are the two mediums employed to distribute information to the blister rust workers.

The News Letter is published monthly under the direction of S. N. Wyckoff. Articles are written on blister rust and allied subjects by members of the permanent organization, with a few articles coming from outside sources. Both the theory and the practice of all work in connection with the blister rust control program are discussed through this medium, which is confidential in nature and is issued to permanent employees and a few interested parties. In the July and August issues the material is less technical and nothing of a controversial nature is printed. These two numbers are sent to all temporary and permanent employees.

Monthly personnel meetings were held on the first Wednesday of each month during the winter season. At each meeting two or three speakers covered subjects related to the blister rust control program and these subjects were then thoroughly discussed. In the fall of 1932 the request for subjects to be covered was so large that it became necessary to hold meetings on the first and third Wednesdays of each month. At a conference held in Spokane from February 8 to 12 and attended by all of the permanent employees, all phases of the work were discussed and reviewed.

2. General public. Newspapers gave a great deal of space to the subject of blister rust control in 1932. Articles released through the local papers were impressive as to the need of continuing the blister rust control program.

Displays were set up at the Sportsmen's and Tourists' Fair held at Spokane in May and the annual meeting of the Washington Horticultural Association held at Wenatchee, Washington, in November. At these places

large demonstration boxes containing pictures and specimens of all stages of the disease were on display. This was supplemented by the automatic balopticon using a continuous set of lantern slides, showing all phases of the blister rust control work. A large number of bulletins were also distributed.

Specimens and enlarged pictures were loaned to the Spokane Chamber of Commerce for a display in the Civic Building. A lecture on blister rust control was given before the students of Whitworth College and this was followed up with a series of specimens and bulletins for classroom use.

<u>Photographic Work Done in the Spokane Office</u>

Prints, 4" x 5" or smaller	81
" 5" x 7"	846
" 8" x 10"	616
" 9" x 11"	2,270
Enlargements, 8" x 10"	10
" 11" x 14"	62
" 16" x 22"	30
" 20" x 26"	22
Copies, 5" x 7"	24
" 8" x 10"	102
Lantern slides made and colored	4
Field films developed, 5" x 7"	154

<u>Educational Material Sent Out</u>

Uredinia mounts	8
Telia mounts	8
Pickled uredinia	1 quart
" telia	2 quarts
" disease on pines	2 quarts
Aecia in individual tubes	52
Seven stage boxes	5
Bulletins and pamphlets	1,481
Pictures under 5" x 7"	4
Pictures, 5" x 7"	666
Pictures, 8" x 10"	235
Pictures, 9" x 11"	728
Enlargements	5
Colored enlargements	6
Lantern slides	9

EXPENDITURES BY THE
WESTERN DIVISION OF BLISTER RUST CONTROL
CALENDAR YEAR 1932

Federal Expenditures

The following tabulations of federal expenditures for the period January 1, 1932 to June 30, 1932 and July 1, 1932 to December 31, 1932 summarize by projects and objects the expenditures of the Western Division of Blister Rust Control.

These tabulations are prepared from detailed expenditure card records maintained by fiscal years for each project and which show the classification of all expenditures as to objects of expenditure, based on the expenditure classifications required by the Bureau of the Budget and the General Accounting Office.

TABLE NO. 1

FEDERAL EXPENDITURES, WESTERN DIVISION OF BLISTER RUST CONTROL
JANUARY 1, 1932 - JUNE 30, 1932

	Project	Salaries	Expenses	Total	Recapitulation of Expenses: Sub-sistence Expenses	Railroad Fares, Pullman, Stage, etc.	Operation Personally Owned Cars	Cost of Transportation in Government Trucks and Sedan	Other Transportation Expenses	Express, Freight, Trucking and Packing	Supplies and Equipment *	Repairs, Rents and Miscellaneous Expenses
2.2	Developing Methods of Ribes Eradication											
	2.22 - Method Studies of Ribes Eradication, Idaho	$2,529.21	$2,983.89	$5,513.10	$98.84	$30.69	$33.35	$13.79	$2.80	$465.83	$2,038.85**	$299.74
	2.25 - Experimental Ribes Eradication, California	3,200.79	1,023.51	4,224.30	508.67	125.31	50.69	41.85	16.04	13.67	87.08	180.20
2.3	Developing and Testing Ribicides and Barberricides											
	2.3-1 - Laboratory Investigations, Ribicides	7,604.58	2,629.13	10,633.71	1,263.74	363.55	74.13	74.61	12.30	111.26	655.54	274.00
	2.3-1 - Laboratory Investigations, Barberricides #	1,489.99	399.00	1,888.99#	36.01	128.73	-	8.30	1.90	.50	150.31	73.25
2.4	Studies in Ribes Ecology											
	2.42 - Idaho	1,200.20	260.76	1,460.96	85.95	40.77	21.90	4.46	2.35	1.47	3.76	100.10
	2.45 - California	1,574.96	248.73	1,823.69	172.63	-	44.55	8.35	.10	1.43	14.76	6.91
3.1	Control Reconnaissance on Federal Lands											
	3.14 - Oregon	2,012.98	488.98	2,501.96	154.70	100.64	127.85	22.11	1.65	3.29	9.59	68.95
	3.15 - California	1,050.00	226.73	1,276.73	116.45	46.55	-	5.18	1.05	9.92	2.25	45.33
3.2	Cooperative Ribes Eradication on Federal Lands											
	3.21 - Savenac Nursery, Montana	372.24	204.93	577.17	69.20	12.22	30.95	-	.50	2.61	85.70	3.79
	3.22-1 - Clearwater National Forest, Idaho	6,194.66	1,413.13***	7,607.79	304.45	66.37	-	57.70	29.24	153.22	722.63	57.52
	3.22-2 - St. Joe National Forest, Idaho	2,248.78	633.01***	2,881.79	30.25	17.42	-	31.45	1.52	48.78	447.38	56.21
3.3	Cooperative Ribes Eradication in National Parks											
	3.33 - Mount Rainier National Park, Washington	208.33	101.58	309.91	28.99	15.89	-	-	.52	12.73	43.45	-
3.4	Cooperative Ribes Eradication Private and State Lands											
	3.42-1 - Clearwater Timber Protective Association, Idaho ##	7,108.10	[illegible]	15,971.28	4,569.12	-	-	7.25	.10	559.13	3,003.95	423.63
	3.42-2 - Potlatch Timber Protective Association, Idaho	1,100.00	23.59	1,123.59	-	-	-	-	-	-	11.62	11.97
	3.42-3 - State of Idaho and Local Owners, vicinity Clarkia, Idaho ##	1,726.93	772.47	2,499.40	242.15	-	-	-	-	122.44	290.23	117.65
	3.42-4 - State of Idaho, Priest Lake, Idaho ##	[illegible]	[illegible]	[illegible]	3,060.32	113.10	-	25.27	11.83	481.39	558.14	44.06
4.1	Field Studies, Spread of the Rust											
	4.11 - Montana	1,415.00	41.10	1,456.10	18.85	21.25	-	-	1.00	-	-	-
	4.12 - Idaho	-	1.15	1.15	-	-	1.15	-	-	-	-	-
	4.13 - Washington	343.33	-	343.33	-	-	-	-	-	-	-	-
	4.15 - California	1,675.00	225.16	[illegible]	81.06	[illegible]	1.50	-	4.91	1.96	8.95	2.20
4.2	Damage to Pine Studies	2,614.98	651.66	3,266.64	396.13	40.92	45.60	79.84	2.42	30.20	9.64	46.91
4.3	Summarization of Field Data	[illegible]	[illegible]	[illegible]	49.24	104.84	-	5.36	2.09	6.19	17.28	-
6.-	Educational Work, Spokane Office	[illegible]	260.22	2,050.20	7.20	40.80	-	10.70	1.15	4.62	184.27	11.48
9.-	Maintenance of Field Office and Miscellaneous Expenses											
	9.1 - Supervision	2,299.98	188.67	2,488.65	52.70	129.37	-	-	6.60	-	-	-
	9.2 - Office Maintenance	8,139.48	2,378.21	10,517.69	12.00	17.99	-	12.36	.70	-	50.00	2,285.16
	9.3 - Miscellaneous Supplies and Services paid on L/A	-	499.98	499.98	-	-	-	96.31	-	17.65	254.78	131.24
	9.4 - Miscellaneous Supplies and Services paid in Washington, D.C.	-	256.28	256.28	-	-	-	-	-	81.35	176.78	[illegible]
	Total January 1, 1932 - June 30, 1932	[illegible]	$29,476.16	$91,760.44	[illegible]	$1,563.19	$431.67	$504.89	$100.77	$2,129.64###	$8,826.94*	[illegible]

\# Expenditures from $4,500 allotment from Division of Barberry Eradication for fiscal year 1932.
\## See also separate report of expenditures from funds contributed by these cooperators - Special Treasury Account.
\### Outstanding freight and express charges for various north Idaho eradication projects estimated at [illegible] and $20.00 for Barberry project, not included in above total.
* "Supplies" include approximately 34 tons chemicals, $4,596.01, distributed to projects 2.22, 2.3-1, 3.22-1, 3.22-2, 3.42-1 and 3.42-3; also $1,343.42 for 10,024 lbs. twine distributed to projects [illegible] 3.42-1, 3.42-3 and 3.42-4.
** Includes also $368.50 for construction of special brush removal blade for bulldozer and [illegible] for gas, oil and grease for bulldozer.
*** Includes $846.28 for chemicals, twine and transportation of same furnished the Forest Service for 3.22-1 and $483.65 for twine and freight on same furnished the Forest Service for [illegible] credit has since been given this Division in the form of meals, supplies, etc.

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TABLE NO. 2

FEDERAL EXPENDITURES, WESTERN DIVISION OF BLISTER RUST CONTROL
JULY 1, 1932 - DECEMBER 31, 1932

	Project	Salaries	Expenses	Total	Recapitulation of Expenses: Sub-sistence Expenses	Railroad Fares, Pullman, Stage, etc.	Operation Person-ally Owned Cars	Cost of Transpor-tation in Government Trucks and Sedan	Other Transpor-tation Expenses	Express, Freight, Trucking and Packing	Supplies and Equipment	Repairs, Rents and Miscel-laneous Expenses
2.2	Developing Methods of Ribes Eradication											
	2.22 - Method Studies of Ribes Eradication, Idaho	$5,232.71	$1,386.14	$6,618.85	-$2.17*	-	$118.30	$45.69	-	$212.60	$234.05**	$777.67
	2.25 - Experimental Ribes Eradication, California	2,616.95	701.25	3,318.20	491.33	$ .84	-	61.96	$ .20	77.80	13.14	56.98
2.3	Developing and Testing Ribicides and Barberricides											
	2.3-1 - Laboratory Investigations, Ribicides	3,924.08	483.08	4,407.16	45.92	129.16	71.23	20.11	1.60	5.85	57.64	151.57
	2.3-1 - Laboratory Investigations, Barberricides #	909.94	360.21	1,270.15#	166.13	25.13	10.54	39.46	-	31.03	38.29	49.63
	2.3-2 - Field Tests of Ribicides	1,478.01	604.98	2,082.99	379.24	59.30	21.00	54.07	.60	53.25	28.82	8.70
2.4	Studies in Ribes Ecology											
	2.42 - Idaho	518.92	315.27	834.19	174.89	-	39.85	-	-	-	.53	100.00
	2.45 - California	654.20	64.59	718.79	22.50	-	18.52	2.17	-	2.02	14.16	5.22
3.1	Control Reconnaissance on Federal Lands											
	3.15 - California	3,950.89	1,042.27	4,993.16	625.46	41.06	-	92.70	7.57	47.71	8.84	18.93
3.2	Cooperative Ribes Eradication on Federal Lands											
	3.21 - Savenac Nursery, Montana	522.50	84.55	607.05	21.00	-	53.65	-	-	-	8.40	1.50
	3.22-1 - Clearwater National Forest, Idaho	12,104.79	281.27	12,386.06	113.10	7.60	57.95	57.02	11.25	25.67	-	8.68
	3.22-2 - St. Joe National Forest, Idaho	6,765.71	261.23	7,026.94	54.39	13.04	19.75	145.52	-	14.27	-	14.26
	3.22-3 - Coeur d'Alene National Forest, Idaho	77.99	207.87	285.86	107.10	-	-	96.11	-	2.89	1.77	-
3.3	Cooperative Ribes Eradication in National Parks											
	3.33 - Mount Rainier National Park, Washington	1,145.64	115.70	1,261.34	98.66	14.99	-	-	1.00	1.05	-	-
3.4	Cooperative Ribes Eradication on Private and State Lands											
	3.42-1 - Clearwater Timber Protective Association, Idaho ##	5,290.69	2,844.02	8,134.71	1,848.62	-	27.23	46.00	-	499.58	228.56	194.03
	3.42-3 - State of Idaho and Local Owners, Vicinity of Clarkia, Idaho ##	1,002.19	370.84	1,373.03	224.57	-	-	2.50	-	24.26	48.19	71.32
	3.42-4 - State of Idaho, Priest Lake, Idaho ##	6,080.69	1,779.80	7,860.49	1,119.69	82.00	-	54.70	26.00	405.03	70.80	21.58
4.1	Field Studies, Spread of the Rust											
	4.11 - Montana	1,045.00	94.48	1,139.48	2.98	-	91.50	-	-	-	-	-
	4.12 - Idaho	284.16	8.68	292.84	8.00	-	-	-	-	.68	-	-
	4.13 - Washington	2,004.34	30.82	2,035.16	19.95	-	-	10.27	-	-	.10	.50
	4.14 - Oregon	879.10	85.08	964.18	34.50	-	42.80	-	-	-	3.06	4.72
	4.15 - California	2,598.91	923.26	3,522.17	444.88	108.95	351.96	-	3.35	5.59	-	8.53
4.2	Damage to Pine Studies	2,695.40	612.03	3,307.43	421.96	26.82	27.34	107.80	-	7.20	12.23	6.68
4.3	Summarization of Field Data	1,077.05	60.80	1,137.85	26.18	34.62	-	-	-	-	-	-
6.-	Educational Work, Spokane Office	1,277.84	441.75	1,719.59	38.13	-	107.47	33.89	-	9.34	223.92	29.00
9.-	Maintenance of Field Office and Miscellaneous Expenses											
	9.1 - Supervision	2,108.16	210.82	2,318.98	87.17	121.15	-	-	2.50	-	-	-
	9.2 - Office Maintenance	6,150.48	2,135.97	8,286.45	-	-	-	-	-	-	-	2,135.97
	9.3 - Miscellaneous Supplies and Services Paid on L/A	-	236.80	236.80	-	-	-	48.40	-	10.26	101.28	76.86
	9.4 - Miscellaneous Supplies and Services Paid in Washington, D.C.	-	50.23	50.23	-	-	-	-	-	19.98	28.09	2.16
	Total July 1, 1932 - December 31, 1932	$72,396.34	$15,793.79	$88,190.13	$6,774.18	$664.66	$1,059.09	$918.37	$54.07	$1,456.06***	$1,121.87	$3,745.49

\# Expenditures from $1,500 allotment from Division of Barberry Eradication for fiscal year 1933.
\## See separate tabulation for expenditures from fund contributed by cooperators - Special Treasury Account.
* Cost of 215 meals furnished Offord and assistants transferred to project 2.3-2 ($75.25) and subsistence supplies secured on warehouse credits due this office through earlier transactions, accounts for this credit item.
** Includes $157.79 for gas, oil and grease for bulldozer.
*** Outstanding freight and express charges for the various projects estimated at $165.00 not included in above total.

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COOPERATIVE EXPENDITURES

The following table summarizes the expenditure of funds contributed by the Clearwater Timber Protective Association for cooperative Ribes eradication on their area; by the State Land Department of the State of Idaho, Potlatch Forests, Inc., and the Milwaukee Land Company for such work in the vicinity of Clarkia, Idaho; and by the State Land Department of the State of Idaho for such work in the vicinity of Upper Priest Lake, Idaho.

The cooperators' contributions were deposited as usual as a special account in the United States Treasury and were disbursed by the Division of Blister Rust Control at Spokane, Washington.

TABLE NO. 3

SUMMARY OF BLISTER RUST CONTROL COOPERATIVE RIBES ERADICATION EXPENDITURES BY THE CLEARWATER TIMBER PROTECTIVE ASSOCIATION, THE STATE LAND DEPARTMENT OF THE STATE OF IDAHO, AND THE MILWAUKEE LAND COMPANY AND POTLATCH FORESTS, INC.

JUNE 1, 1932 - SEPTEMBER 30, 1932

Cooperating Agency	Wages	Expenses	Total	Recapitulation of Expenses: Subsistence Supplies	Transportation of Equipment and Supplies	Miscellaneous Supplies and Services
June 1-30, 1932:						
Clearwater Timber Protective Association	-	-	-	-	-	-
State Land Department, State of Idaho; Potlatch Forests, Inc.; Milwaukee Land Company	$166.60	$64.85	$231.45	$55.45	$6.90	$2.50
State Land Department, State of Idaho	-	1,330.50	1,330.50	993.66	304.99	31.85
Total June 1-30	$166.60	$1,395.35	$1,561.95	$1,049.11	$311.89	$34.35
July 1 - September 30, 1932:						
Clearwater Timber Protective Association	$10,064.35	-	$10,064.35	-	-	-
State Land Department, State of Idaho; Potlatch Forests, Inc.; Milwaukee Land Company	890.53	-	890.53	-	-	-
State Land Department, State of Idaho	6,672.93	-	6,672.93	-	-	-
Total July 1 - September 30, 1932	$17,627.81	-	$17,627.81	-	-	-
Grand Total, June 1 - Sept. 30, 1932	$17,794.41	$1,395.35	$19,189.76	$1,049.11	$311.89	$34.35

For federal expenditures for these projects see projects 5.42-1, 5.42-3, 5.42-4 on statements of Western Federal Blister Rust Control expenditures, January 1, 1932 - June 30, 1932 and July 1, 1932 - December 31, 1932.

GENERAL SUMMARY

I. Development of Local Control Practice

A. Eradication.

1. California. 800 acres on the Stanislaus National Forest were freed of 61,919 Ribes, an average of 77.4 per acre, at an average cost of $1.57 per acre.

2. Idaho.

a. Studies on chemical eradication methods consisted of a check on the experimental work performed in 1931 and further experimentation with chemicals and methods of application. The following conclusions are drawn from the 1931 experiments. In using sodium chlorate in solution for soil drenching, the plots receiving 2 to 4 pounds of chemical per square rod showed considerable damage. A very good kill was secured on plots treated with a mixture representing approximately a 5 per cent solution. In the application of chemicals in dry form no satisfactory kill was secured except on one plot and equally satisfactory results can be obtained with a smaller amount of sodium chlorate when applied in solution in two successive treatments. A test of the seasonal toxicity of various concentrations of Atlacide and sodium chlorate sprays gives the basis for recommending a 10 per cent solution of sodium chlorate on knapsack spraying operations for killing R. petiolare with all spraying to be completed as early as conveniently possible. Present information shows that the most successful method of killing R. inerme and R. lacustre involves two successive treatments, the first with a 5 per cent solution of sodium chlorate applied to bushes and soil at the rate of 16 gallons per square rod and the second, a similar application with a 10 per cent solution at the rate of 4 gallons per square rod, allowing a sufficient period between treatments to permit resprouting or releafing of Ribes. Atlacide applied in the form of dust does not compare favorably with standard spraying methods. Stem, root and crown injections are ineffective as far as copper complex paste is concerned. Any method requiring root and crown injections involves a great amount of labor in locating roots and crowns. The application of salt to the soil as made in the experiments conducted is not a practical method of Ribes suppression.

The experiments started in 1932 include aerial spraying and soil drenches with sodium chlorate and ammonium thiocyanate, ammonium thiocyanate applications in dry form to the soil, use of different volumes and concentrations of sodium chlorate applied to aerial and root systems of Ribes, and extensive work with sodium chlorate and ammonium thiocyanate. While it is impossible to draw many definite conclusions from these studies until more time has elapsed, it can be stated that ammonium thiocyanate is not practical for use on R. petiolare. An experiment was also started to determine whether draining beaver dams before spraying R. petiolare would result in a better kill than formerly secured in such sites.

I. Development of Local Control Practice

A. [illegible]

1. California. 500 acres on the Stanislaus National Forest were freed of 51,910 Ribes, an average of 77.4 per acre, at an average cost of $1.57 per acre.

2. Idaho.

a. Studies on chemical eradication methods consisted of a [illegible] tion with chemicals and methods of application. The following conclusions are drawn from the 1931 experiments. In using sodium chlorate in solution for soil drenching, the plots receiving 2 to 4 pounds of chemical per square rod showed considerable damage. A very good kill was secured on plots treated with a mixture representing approximately a 5 per cent solution. In the application of chemicals in dry form no satisfactory kill was secured except on one plot and equally satisfactory results can be obtained with a smaller amount of sodium chlorate when applied in solution in two successive treatments. A test of the seasonal toxicity of various concentrations of Atlacide and sodium chlorate sprays gives the basis for recommending a 10 per cent solution of sodium chlorate on knapsack spraying operations for killing *R. petiolare* with all spraying to be completed as early as conveniently possible. Present information shows that the most successful method of killing *R. inerme* and *R. lacustre* involves two successive treatments, the first with a 5 per cent solution of sodium chlorate applied to bushes and soil at the rate of 16 gallons per square rod and the second, a similar application with a 10 per cent solution at the rate of 4 gallons per square rod, allowing a sufficient period between treatments to permit resprouting or releafing of Ribes. Atlacide applied in the form of dust does not compare favorably with standard spraying methods. Stem, root and crown injections are ineffective as far as copper complex paste is concerned. Any method requiring root and crown injections involves a great amount of labor in locating roots and crowns. The application of salt to the soil as made in the experiments conducted is not a practical method of Ribes suppression.

The experiments started in 1932 include aerial spraying and soil drenches [illegible] applications in dry form to the soil, use of different volumes and concentrations of sodium chlorate applied to aerial and root systems of Ribes, and extensive work with sodium chlorate and ammonium thiocyanate. While it is impossible to draw many definite conclusions from these studies until more time has elapsed, it can be stated that ammonium thiocyanate is not practical for use on *R. petiolare*. An experiment was also started to determine whether draining beaver dams before spraying *R. petiolare* would result in a better kill than formerly secured in such sites.

b. Studies on hand eradication methods were confined to testing the feasibility of cutting off R. viscosissimum bushes at the ground level, above the crown, where these bushes were growing in competition with dense brush. No results will be available until the 19[illegible] season.

c. Experimental and field equipment was developed or tested, which included the following: a broadcast power sprayer for use in Ribes eradication by chemicals, hand horn nozzles, straight stream fire nozzles for hand pumps, and a special blade and teeth for a bulldozer.

d. Brush elimination as a means of permanent Ribes suppression. A Cletrac tractor equipped with a bulldozer attachment which was fitted with a special blade having adjustable teeth was employed on an experimental basis on an area where the cost by the hand pulling method of Ribes eradication was prohibitive. On more than 90 per cent of the area costs were lower than those resulting from previous experiments with other methods. It was found that hand pulling and spraying should play a prominent part on a brush clearing operation. Wet ground constituted the greatest obstacle. New methods in preparing the area for work by the bulldozer, and in the location and condition of the brush piles were also tested. Brush removal followed by seeding was continued and experiments were conducted in methods of draining areas to facilitate brush elimination.

B. Reeradication.

1. California. Four years after the first working on the Stanislaus National Forest, 14,21[illegible] bushes were removed from 6,[illegible] acres or an average of [illegible].4 bushes per acre at an average cost of [illegible] per acre. This reeradication work shows that there was a decrease of 7[illegible] per cent in Ribes eradicated per acre, a 91 per cent decrease in feet of live stem per acre and a 74 per cent decrease in cost per acre as compared with the initial working.

C. Development and Testing of Ribicides

1. Research work. Investigative work was conducted along the following lines: establishing of minimum dosage of sodium chlorate to be used as a soil drench, aerial spray or a combination of these; new killing agents; application of chemical to stems and roots as compared with complete coverage; the application of small quantities of chemical to scarified crowns; and the continuation of tests on fire-resistant properties of trouser material.

2. Summary of field experiments

a. Results of 19[illegible]1 experimental chemical treatments in the

b. Studies on hand eradication methods were continued [illegible] testing the feasibility of cutting off [illegible] bushes at the ground level, above the crown, where these bushes were growing in competition with dense brush. No results will be available until the [illegible] season.

c. Experimental and field equipment was developed or tested, which included the following: [illegible] for use in Ribes eradication by chemicals, [illegible] corn [illegible] fire nozzles for hand pumps, and a special blade and teeth for a bulldozer.

d. [illegible] methods. It was found that hand pulling and spraying should play a [illegible] the location and condition of the brush piles were also [illegible]

E. [illegible]

1. California. [illegible] National Forest. [illegible] initial [illegible].

F. Development and testing of [illegible]

1. Research work. Investigative work was conducted along the following lines: [illegible] complete coverage; the application of small quantities of chemical to [illegible] and the continuation of tests on [illegible] of [illegible] material.

2. [illegible] of field experiments

a. Results of [illegible]

Stanislaus National Forest. None of the experiments used, which included sprays, dusts, soil fumugation with gas, and injection and tubulation, were successful in killing bushes upon which they were tested.

b. A recheck of the 1926 experimental plots at Clarkia, Idaho. The influence upon the outcome of the experiments which was exerted by the large variation in type of site within the area was so great as to render the effects of many of the variations in the experimental treatments themselves completely unrecognizable. None of the chemical treatments applied were satisfactorily effective upon R. petiolare growing in locations characterized by beaver dams, much running water, very heavy brush and windfalls.

c. Results of 1931 experimental chemical treatments in Washington. These experiments seem to rule out further consideration of zinc sulphate and ethylene oxide. Copper complex is removed from further consideration as a soil poison for stream type Ribes eradication while Diesel oil treatments were fairly effective. Ammonium thiocyanate and sodium chlorate were the two most satisfactory chemicals used.

The experiments must also be regarded as preliminary steps in the investigation of the relative merits of the several methods of application as well as attempts to establish dosage limits. The injection method proved itself definitely unsuitable for stream type or thicket Ribes eradication.

d. Field experiments conducted in 1932. Problems selected for study included a comparison and evaluation of sodium chlorate and ammonium thiocyanate as herbicides on R. inerme; the determination of the relative effectiveness of these chemicals when applied by different methods; establishment of minimum dosage for these chemicals on R. inerme; testing of an inorganic arsenic compound.

D. Barberry Investigations.

1. Research work. Investigative work was carried on along the following lines: establishment of minimum dosage of sodium chlorate and ammonium thiocyanate for 100 per cent kill; establishment of value of solid dilutent for use with ammonium thiocyanate; search for and test of new killing agents; comparison of aqueous solutions of various chemicals on the basis of minimum dosage and most effective distribution; comparison of viability of seeds from treated and untreated plants; establishment of a more definite measure for the application of common salt; and a test of the effectiveness of sodium chlorate and copper complex for tubulation work.

2. Results of 1930 and 1931 field experiments.

a. Recheck of 1930 experiments at Maumee, Ohio. Data taken

on all plots were substantially the same as in 1931 with plots sprayed with sodium chlorate or Atlacide still being the only ones showing 100 per cent kill of barberry plants. The individual bush treatments were still 100 per cent effective in cases where the surface litter at the base of the plant was removed and chemical was applied about the crown. Of the other methods used, all resulted in increased shoots on bushes the second year except where bushes were cut off and a hole was bored in the crown and then filled with paste.

2. Results of 1931 treatments and experiments at Pennsylvania Furnace, Pennsylvania. Four general methods were used but in only one case was the chemical 100 per cent effective and this cannot be recommended for field use due to the difficulty of application. In the case of all other chemicals they did not, in the quantities used, effect consistently good kill. Results of spraying were not consistent with previous results reported due to drought conditions and lower dosages, but oil sprays can be definitely ruled out of consideration as killing agents.

3. Experiments undertaken at Pennsylvania Furnace, Pennsylvania in 1932. Two chemicals were tested by spray application, three chemicals were tested by soil application in solid or aqueous form, two chemicals were used in tubulation experiments, treated bushes were grubbed out to determine condition of roots and tests were conducted to determine length of time that certain chemicals remain as toxic substances in field soils.

4. Experiments undertaken in Ohio and Wisconsin. Practical field tests were made at Maumee, Ohio of ammonium thiocyanate and sodium chlorate in crown application, subsurface drench, aerial spray and a combination of the latter two. In Wisconsin crown applications were made with salt, and ammonium thiocyanate in solid form.

E. Studies in Ribes Ecology.

1. Idaho. A study was made of the effects of various cutting practices on Ribes seed germination and seedling survival. The results of the study are only tentative and will merely serve as an index. Clear cutting followed by broadcast burning produces conditions favorable for the inception and continued survival of large numbers of R. viscosissimum. Disturbances produced by the construction of railroad grades have the same effect as clear cutting. Selective cuttings are followed by moderate numbers of R. viscosissimum for one or two years after logging but each succeeding year shows a rapid decline in their numbers. Selective logging apparently assures restocking of white pine and other coniferous reproduction which appears to be thriving and increasing at the end of the fourth year following logging. This method does not have a marked effect on either R. lacustre or R. petiolare since these species tend to be somewhat limited to stream areas where conditions are changed very little by logging operations.

A study was initiated to determine the effects on upland Ribes of the closing in of the forest canopy. No conclusions can be drawn for at least one more year.

Studies were continued regarding laboratory germination of Ribes seed stored in the duff. Improvements were made in the technic of germination methods as well as the care of the seedlings. For the total number of all seedlings, as well as Ribes seedlings, from 81 to 90 per cent were in the bottom layer of duff, 8 to 16 per cent were in the middle layer and 1 to 2 per cent were in the top layer. Viable Ribes seeds were present in all timber stands including the 200+ age class with the exception of the 61 to 80 and 101 to 120 age classes. The number of viable Ribes seeds present in the duff decreased as the age of the timber stand increased.

2. California. The work in 1932 consisted of a continuation of studies, started in previous years, concerning the effect of logging on Ribes establishment, Ribes seed storage in duff and soil and Ribes seed germination and seedling survival. No final results have been obtained although the studies have yielded the following points in addition to those previously reported; in sugar pine-fir and sugar pine-ponderosa pine types Ribes seedlings began to appear the second year after logging but the number dropped considerably during the third year; in stream type they appear the first year and drop off in the third year; the Forest Service, economic and heavy cutting methods have all permitted the germination and survival of a large number of Ribes during the last three years; the removal of Ribes twice (in 1926 and 1929) before logging did not prevent a sizable Ribes flora after logging.

II. Application of Local Control

A. Control Reconnaissance.

1. California. Intensive reconnaissance was completed on 63,010 acres on the Stanislaus and Eldorado National Forests at a cost of $.055 per acre.

In order to formulate a Ribes eradication policy for the sugar pine stands of California all available information regarding stands and types is being collected. This is a joint undertaking between the Forest Service and the Division of Blister Rust Control.

B. Preeradication Survey.

1. Idaho. A survey covering 519,540 acres showed 176,410 acres of white pine on areas considered in present protection plans. The estimated average cost per acre for initial working of this area was $3.46.

C. Ribes Eradication on Federal Lands.

1. Clearwater National Forest, Idaho. Initial Ribes eradication was performed on 50,524 acres at a cost of $2.62 per acre. Second Ribes eradication was performed on 2,414 acres of stream type at a cost of $4.65 per acre.

2. St. Joe National Forest, Idaho. 22,807 acres were actually worked at a cost of $4.19 per acre. 28,032 acres were partially protected at a cost of $3.33 per acre.

3. Mount Rainier National Park. 865 acres were worked at an average cost of $10.38 per acre for both upland and stream type Ribes eradication. Reeradication was performed on 421.2 acres at an average cost of $2.75 per acre.

D. Cooperative Ribes Eradication

1. Clearwater Timber Protective Association, Idaho. 11,571 acres were actually worked at an average cost of $2.02 per acre. This area includes upland and stream type Ribes eradication. 1,529 acres of stream type reworked at an average cost of $3.66 per acre.

2. Priest Lake Timber Protective Association, Idaho. 17,306 acres were worked at an average cost of $1.23 per acre for both upland and stream type Ribes eradication.

3. Upper St. Maries River. Agencies cooperating with the Division of Blister Rust Control were the State of Idaho, Potlatch Forests, Inc., and the Milwaukee Land Co. 1,570 acres were worked at an average cost of $2.56 per acre. This includes both stream type and upland Ribes eradication.

E. Checking Efficiency of Ribes Eradication Work

1. Idaho. Checking was done on all units where Ribes eradication was being conducted with results as follows: on the Clearwater National Forest there was an average for all eradication types of 16 bushes with 71 feet of live stem per acre following Ribes eradication; on the St. Joe National Forest 5 bushes with 23 feet of live stem per acre; on the Clearwater Timber Protective Association 9 bushes with 42 feet of live stem per acre; on the Priest Lake Timber Protective Association there were 5 bushes with 49 feet of live stem per acre; on the Upper St. Maries River there was 1 bush with 13 feet of live stem per acre; and at the Savenac Nursery there were 7 bushes with 11 feet of live stem per acre.

III. Field Studies of the Rust

A. Spread of the Rust

1. New pine infections.

a. Idaho. There were 13 additional pine infection centers

1. Clearwater National Forest, Idaho. Initial [illegible] eradication was performed on [illegible] acres at a cost of $[illegible] per acre. [illegible] eradication was performed on 2,464 acres of stream type at a cost of $4.65 per acre.

2. St. Joe National Forest, Idaho. [illegible] worked at a cost of $[illegible] per acre. [illegible] acres were partially [illegible] at a cost of $13.38 per acre.

3. Mount Rainier National Park. 356 acres were worked at an average cost of $[illegible] per acre [illegible]. Reeradication was performed on [illegible] acres at an average cost of $2.71 per acre.

B. Cooperative Ribes Eradication

1. Clearwater Timber Protective Association, Idaho. [illegible] acres were actually worked at an average cost of $[illegible] per acre. This acreage includes upland and stream type Ribes eradication. 1,[illegible] acres of stream type reworked at an average cost of $2.66 per acre.

2. Priest Lake Timber Protective Association, Idaho. 17,366 acres were worked at an average cost of $[illegible] per acre for both upland and stream type Ribes eradication.

3. [illegible] of [illegible] and the Milwaukee Land Co. 1,870 acres were worked at an average cost of $[illegible] per acre. This includes both stream type and upland Ribes eradication.

C. Checking Effectiveness of Ribes Eradication Work

1. 1938. [illegible]

III. Field Studies of the Rust

A. Spread of the Rust

1. [illegible] pine infection.

a. Idaho. There were 16 additional pine infection centers

found in 1932, four of which were on the St. Joe National Forest, five on the Coeur d'Alene National Forest, four on the Clearwater National Forest, and three on the Clearwater Timber Protective Association. The centers found on the Coeur d'Alene National Forest are all outside of the region in which _R. petiolare_ occurs.

2. New Ribes infections.

a. Idaho. Ribes infections were found on the Kaniksu National Forest, the Palouse Division of the St. Joe National Forest and on the Selway National Forest, the latter two in localities where it has not been located previously.

b. Oregon. Noteworthy new infections were located at 11 points none of which mark a further extension southward than reported in previous years.

3. Scouting in California.

Scouting in 17 counties in northern and northeastern California failed to locate any blister rust infection.

B. Pine Infection Studies.

1. Long Meadow Creek, Idaho.

Studies have been conducted on this area since 1929. Ribes eradication was performed in 1929 and the area was reworked in 1931. Results of 1932 studies showed an increase of 43 feet of live stem per acre over that found in 1931. An analysis of 26 selected trees shows the probable year of origin as follows: 115 in 1930, 110 in 1929, 104 in 1928, 39 in 1926-27, and 22 unknown. On the entire study area there were 303 trees infected which is 44.2 per cent of the trees examined and there was an average of 3.4 cankers per infected tree.

2. Newman Lake, Washington.

Canker analysis shows that 72 per cent of the cankers found were dead. In 1932 the first canker was found on the plot which can be definitely attributed to _R. lacustre_. The per cent of pines infected increased from 9.6 per cent in 1931 to 11.5 per cent in 1932 while the number of cankers per infected tree decreased from 14.1 in 1931 to 12.7 in 1932. A study of Ribes infection showed a large increase in amount of infection of _R. lacustre_ despite a decrease in production of aecia, due probably to more favorable weather conditions. The percentage of infection that developed telia was smaller than in 1931. This is probably accounted for by the large amount of defoliation due to heavy infection;

found in 1932, four of which were on the St. Joe National Forest, five on the Coeur d'Alene National Forest, four on the Clearwater National Forest, and three on the Clearwater Timber Protective Association. The [illegible] found on the Coeur d'Alene National Forest are all outside of the region in which R. petiolare occurs.

2. New Ribes Infections.

a. Idaho. Ribes infections were found on the Kaniksu National Forest, the Palouse Division of the St. Joe National Forest and on the Selway National Forest. The latter one is significant since it has not been located previously.

b. Oregon. Noteworthy new infections were located at 11 points some of which mark a further extension southward than reported in previous years.

3. Scouting in California.

Scouting in 17 counties in northern and northeastern California failed to locate any blister rust infection.

4. Pine Infection Studies.

1. Long Meadow Creek, Idaho.

Studies have been conducted on this area since 1930. Ribes eradication was performed in 1930 and the area was reworked in 1931. Results of 1932 studies showed an increase of [illegible] over that found in 1931. An analysis of [illegible] shows the probable year of origin as follows: 118 in 1922, 106 in 1927, 224 in 1928, 38 in 1929-30, and 22 unknown. In the entire study area there were 307 trees infected which is 46.2 per cent of the trees examined and there was an average of 3.4 cankers per infected tree.

2. Hanson Lake, Washington.

Canker analysis shows that 75 per cent of the cankers found were dead. In 1932 the first canker was found on the plot which can be definitely attributed to R. lacustre. The per cent of pines infected increased from 7.6 per cent in 1931 to 11.4 per cent in 1932 while the number of cankers per infected tree increased from 16.1 in 1931 to 13.7 in 1932. A study of Ribes infection showed a large increase in amount of infection on R. lacustre [illegible] - decrease in production of [illegible], due probably to more favorable weather conditions. The percentage of infection that developed telia was smaller than in 1931. This is probably accounted for by the large amount of defoliation due to heavy infection.

3. Cherkye, B. C.

No work had been done on this plot since 1930 when 15.1 per cent of the pines were infected as compared with [illegible] per cent in [illegible]. The data taken suggest a fairly constant relationship between infected and killed trees in a uniform age class. Calculations show a fairly definite relationship each year between the number of cankers formed and feet of needle stem. Susceptibility studies show the per cent of infection as follows: P. lambertiana 1.8 per cent infected; P. monticola 2.7 per cent; P. flexilis 1.9 per cent; and P. strobus [illegible] per cent infected; or an average for all species of 2.2 per cent.

C. Effectiveness of Control Studies.

Studies designed to determine the effect of stream type Ribes eradication upon the Ribes population show that generally there is an annual increase in the total feet of Ribes live stem per acre. Apparently there is a high mortality of seedlings between the first and second year and a rapid growth between the second and third year of these life.

On several areas where it is evident that Ribes in the stream type were responsible for the infection, studies were conducted to determine the amount of pine infection originating after initial Ribes eradication. At no pine infection center adjacent to stream type worked in [illegible] were any cankers found that originated after Ribes eradication. Cankers on unworked areas consisted chiefly of cankers formed after [illegible]. It is evident that the stream type work has been very effective in retarding the spread of the disease on immediately adjacent areas.

D. Ribes Susceptibility Studies.

At the Rhododendron, Oregon Ribes garden, five species showed extremely heavy infection following heavy inoculations. Four species showed heavy infection and one species showed no infection.

IV. Educational Work.

Educational work was carried on with Ribes-control personnel, Forest Service personnel, timber owners and administrators, educational institutions and the general public. Information was disseminated by the use of demonstration material, talks and papers, and a monthly news letter.